SCIENTIFIC AMERICAN

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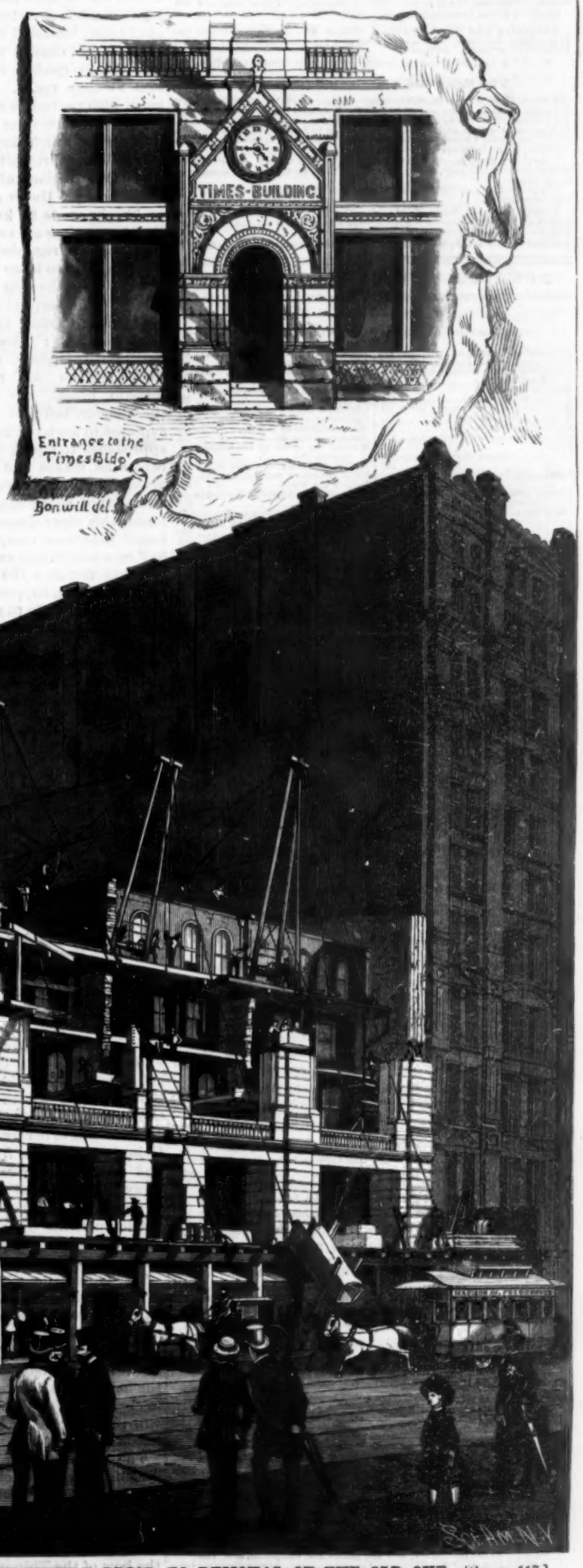

THE NEW "TIMES" BUILDING, NEW YORK—ERECTION OF THE NEW STRUCTURE PRIOR TO REMOVAL OF THE OLD ONE.—[See p. 117.]

Scientific American.

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NEW YORK, SATURDAY, AUGUST 25, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 660.

For the Week Ending August 25, 1888.

Price 10 cents. For sale by all newsdealers.

SOME NEW FRENCH TORPEDO BOATS.

In the construction of the new French torpedo boats the principal faults of the earlier types seem to have been corrected in large degree. They have stability as well as speed, and are said to be of much simpler design, having more room below for the crew, more air, and less vibration, though, of course, there must always be a deal of this where powerful engines are worked within a light shell. L'Agile and l'Audacieux, fitted at La Seyne, near Toulon, under Admiral Krantz, have been maneuvering in the Channel, in rough water, too, and gave a fine account of themselves, making twenty knots an hour on an average of four hours' work under unfavorable as well as favorable conditions; running with and against the current, the wind being fairly abeam for the most part, and consequently a disadvantage. Each is 42 meters in extreme length, and good sized boats, intended, as may be guessed, for service on the open sea, outside roads and harbors; fitted each with three torpedoes, to be fired from submarine chambers at close range. Each has a battery of machine guns, with protective shields, thus enabling the crew to return the fire from the deck and tops of an enemy's ship against which they may be advancing.

The Coureur, recently tried at Cherbourg, was constructed in England after French designs and for the French navy. Under conditions not particularly favorable she made 26 knots an hour, and, remembering that her engines are not yet worn smooth by attrition, this must be regarded as an astonishing rate. The Coureur has two lance torpedoes to be fired in the subcurrent when the ship is brought up close aboard an enemy. The torpedo cruiser Wattignies, named after the great Carnot and now fairly complete, will soon be tried; great things being expected of her. With engines of 4,000 H. P., she is looked to to surpass all previous records of sea-going torpedo boats. She is built on the same lines as the Condor, being of 1,273 tons displacement, and is expected to keep out into the open sea; guarding the approaches to a port or intercepting an enemy even before he makes the land. She has light sides but heavily protected bows and deck to enable her to resist a stray shot as she comes up to deliver her torpedo—a formidable cigar-shaped torpedo; it is as sharp as an arrow, capable of carrying a large explosive force, and having a second and even a third one in reserve should the first not give the enemy his *coup de grace*. As may have been supposed, the Wattignies is a double-ender, having only to reverse her engines after delivering her blow. At the port of Lorient, two torpedo dispatch boats are being built, after much modified plans of the Bombe, which is of 321 tons, and, as will be remembered, capable of excellent work as a torpedo catcher, as was shown in last year's trials at Boulogne-sur-Mer.

COLLISION BETWEEN OCEAN STEAMERS.

Since the collision between the Celtic and Britannic, which was described at the time in these columns, no marine disaster has occurred of equal importance to that which we are now called upon to chronicle. Early in the morning of August 14, off Sable Island near Newfoundland, two steamers of the Thingvalla line plying between New York, Stettin, Christiania, and Copenhagen, collided. One had left New York three days before, the other was bound to the same port. The story of the occurrence recalls the Celtic-Britannic collision. Both ships were of the same line. Neither steamer saw the other until they were close together. Had they continued on a straight course, or had they both steered to starboard, they might have escaped. But they seemed to have put their helms in opposite directions, and the effect was that the Thingvalla headed for the Geiser. The engines were backed on both ships, but they could not check the headway which brought them together. The Thingvalla struck the Geiser almost amidships, cutting deeply into her side, and crushing in her own bow. As she backed away, the Geiser's crew made frantic efforts to lower the boats and set free a life raft. The boat capsized or drifted away, and the mast falling on the life raft destroyed it and crushed some of the men about it. In about five minutes the Geiser sank. A few of her passengers and crew were rescued, but about one hundred souls were lost.

The Thingvalla, whose boats had saved the few survivors, remained afloat. Her forward bulkhead kept out the water. She was far from secure, and her captain signaled for help. Some hours after the disaster the steamer Wieland answered the signals and took off about five hundred people, bringing them along with the news of the disaster to this port. The Thingvalla in charge of a small crew was headed to the west, and will probably make Halifax or St. Johns, N. F., as a harbor.

The scene on board of the Geiser is described as dreadful. A great hole was made in her deck, and the frightened passengers came rushing forward with such impetuosity that some of them plunged through it into the water. The escape of the second officer was a remarkable one. He was in his berth at the time, and the bow of the Thingvalla crushed through the ship's side, almost touching him. Her anchor chain, as her bow entered his stateroom, swung near him. With extraordinary presence of mind he grasped its links, and as the Thingvalla backed away she carried him with her through the Geiser's side. He climbed up the chain to her deck, and from that point saw the last struggles of his own ship.

A court of inquiry will be held, and efforts will be made to determine the reasons of the occurrence, and to fix the blame where it belongs. But little good will be done by this. The lesson of the disaster is one that has often been given, and as often has been practically unheeded. With such proved liability to collision, the ocean liners should be provided with more efficient apparatus, as well for the prevention of accidents as for the saving of life when the inevitable collision or sinking occurs.

Common boats proved, as they repeatedly have before, of little use. The one life raft of which mention was made was destroyed. The life preservers, of which it is said there were three for every soul on board, proved useless, as the panic-stricken passengers rushed on deck without them. The reversal of the engines of the ships was also useless, as their headway was practically unchecked. The few signals that were sounded before the accident were fruitless. Had the ships been supplied with marine brakes their progress would have been so quickly arrested that the disaster might have been averted.

As regards ocean traffic, the need of the day is evident. The management of the transatlantic lines have every motive to adopt improvements in life-saving devices, in improved signaling, and in aids to navigation. The question of expense should be secondary. The interruption to business and the injury to reputation that follow these disasters represent a loss that insurance does not cover. It seems as if due efforts in the direction of insuring safety at sea had not been made in the present instance, when the appliances of the sinking ship did nothing worthy of mention to save the life of her crew and passengers. The efforts of inventors to cover this ground should receive more than the usual encouragement. It is a question of saving life as well as property, and philanthropy and business in this are hand in hand. A ship should be able to define her course and rate of progress: she should be able to stop before a mile of water has been covered. Unsinkable and indestructible rafts should be on her deck, and life preservers should be easily adjustable and accessible.

SURE DEATH TO BUFFALO MOTHS.

A lady correspondent sends us the following: Take strips of red or blue flannel (as these colors are particularly attractive to them), dip in liquid arsenic and lay around the edges of carpets, or wherever the pests are troublesome. They will soon eat a desired amount and collapse, to the entire satisfaction of the housewife, without the least injury to her carpets.

The Temperature of Our Food and Drinks.

Of all nations, the American is the most in the habit of taking his food and drink at a temperature as remote as possible from that of the body. Ice-water drinking is a national habit, and ice cream is a national dish, predilection for which runs through all classes of society, and becomes a binding force in social and, we might add, scientific and religious gatherings. Americans should, therefore, take an interest in the experimental researches on the temperature of our food and drink made by certain foreign savants whose names are, as is usual, hyperplasic with consonants just in proportion to the rigidity of their science and the seriousness of their inquiries.

The temperature of our food and drinks was treated of by Von Spath and Kostjurin a year ago (*Muncheners Medic. Wochenschr.*, 1886, p. 533), and more recently by Uffelmann, of Rostock (*Ibid.*, 1887, p. 999).

Professor Uffelmann reviews the work of his predecessors, and draws his conclusions partly from this and partly from his own experiments. They bear first upon the temperature of ingesta in health, and the rules laid down are:

1. That, in general, a temperature of food and drink which approaches that of the blood is most healthful. For nurslings such temperature is essential.

2. For quenching the thirst, the best temperature is from 50° F. to 68° F. The favorite American temperature is, as is well known, 32° F., and an issue is raised at once between Professor Uffelmann and the American nation.

3. The ingestion of very hot or very cold food or drink in health has a damaging effect, which is increased just in proportion to the rapidity with which the hot or cold substance is taken. Hence the gulping down of ice water or hot coffee, etc., means eventually, according to the light we are quoting, a mere ventral damnation. If a person takes a drink for the purpose of warming himself, as in cold weather, he can accomplish this by having the drink at a temperature of 116° to 120° F.

4. The use of very hot and cold substances, following or alternating, is injurious to the teeth. But the

taking of cold water lessens the injurious action of extremely hot substances upon the stomach.

5. Ingestion of cold food and drinks lessens the bodily temperature, whether it be normal or febrile.

6. Cold fluids lessen the hyperirritability of the stomach.

Cold ingesta raise the tone of the stomach, increase peristalsis, and promote movement of the bowels. Cold food and drinks increase the tendency to cough, according to Uffelmann, by causing reflexly a congestion of the bronchial vessels. Hence, persons with bronchial disease ought not to indulge in cold drinks. It is, however, a common custom to give persons who suffer from plumonary hemorrhage ice to swallow; and, according to the view stated, this would be an injurious practice.

Hot food and drinks stimulate the stomach more than cold. But after repeated use they lessen the tonus of the digestive tract, and cause congestion and dyspepsia. This condition has been observed after the so-called hot water cure. Hot drinks tend to lessen bronchial irritation, and this is one cause, possibly, of the success in some cases of the hot water treatment of consumption.—*Medical Record.*

Mineral Resources of the United States, 1887.

From advance sheets of the volume of Mineral Resources of the United States for 1887, by Prof. David T. Day, we take the following statistics:

Metallic Products of the United States in 1887.

	Quantity.	Value.
Pig iron, spot value.....long tons..	6,417,148	$121,925,800
Silver, coining value.....troy ounces..	41,309,240	53,441,300
Gold, coining value..... "	1,596,500	33,100,000
Copper, value at New York City...pounds..	184,670,524	21,052,440
Lead, value at New York City...short tons..	160,700	14,463,000
Zinc, value at New York City. "	50,340	4,782,300
Quicksilver, value at San Francisco.....flasks..	33,825	1,429,000
Nickel, value at Philadelphia.....pounds..	205,556	133,200
Aluminum contained in alloys.....		74,905
Antimony, value at San Francisco.....short tons.	75	15,500
Platinum, value (crude) at New York City.....troy ounces..	448	1,838
Total.....		$250,419,283

Non-Metallic Mineral Products of the United States in 1887 (*spot values*).

	Quantity.	Value.
Bituminous coal.....long tons..	78,426,214	$97,939,656
Pennsylvania anthracite..... "	37,578,747	84,552,181
Building stone.....		25,000,000
Lime.....barrels..	46,750,000	23,375,000
Petroleum..... "	28,249,543	16,949,726
Natural gas.....		13,582,500
Cement.....barrels..	6,692,744	5,186,877
Salt..... "	7,831,062	4,093,846
Limestone for iron flux.....long tons..	5,377,000	3,226,200
South Carolina phosphate rock.. "	480,558	1,836,818
Zinc white.....short tons..	18,000	1,440,000
Mineral waters.....gallons sold..	8,250,609	1,361,473
Borax.....pounds	11,000,000	550,000
Gypsum.....short tons..	95,000	425,000
Manganese ore.....long tons..	34,524	333,844
Mineral paints..... "	20,000	310,000
New Jersey marls.....short tons..	600,000	300,000
Pyrites.....long tons..	52,500	210,000
Flint..... "	32,000	185,000
Mica.....pounds..	70,500	142,250
Corundum.....short tons..	600	108,000
Sulphur..... "	3,000	100,000
Precious stones.....		88,600
Crude barytes.....long tons..	15,000	75,000
Gold quartz, souvenirs, jewelry, etc.....		75,000
Bromine.....pounds..	129,087	61,717
Feldspar.....long tons..	10,200	56,100
Chrome iron ore..... "	3,000	40,000
Graphite.....pounds..	416,000	34,000
Fluorspar.....short tons..	5,000	20,000
Slate, ground as pigment.....long tons..	2,000	20,000
Cobalt oxide.....pounds..	18,340	18,774
Novaculite..... "	1,200,000	16,000
Asphaltum.....short tons..	4,000	16,000
Asbestos..... "	150	4,500
Ruelle.....pounds..	1,000	3,000
Total.....		$281,637,062

Résumé of the Values of the Metallic and Non-Metallic Mineral Substances Produced in the United States in 1887.

Metals.....	$250,419,283
Mineral substances named in the foregoing table..	281,637,062
	$532,056,345
Estimated value of mineral products unspecified.....	6,000,000
Grand total.....	$538,056,345

Buckthorn in Toothache.

Dr. Gretchinsky has called attention to a practice which obtains among the peasantry in some parts of Southern Russia of treating toothache with a gargle of decoction of buckthorn—*Rhamus catharticus.* He states that in order to test the ground for this practice, he made a series of control experiments upon a number of inmates of the local prison who were suffering from toothache. The patients were ordered to gargle their mouths with the cooled decoction every three or five minutes until the pain disappeared, and in every case the suffering ceased in about half an hour, though there still remained a vague aching or kind of itching about the teeth. A prolonged anodyne effect was produced by inserting a cotton wool plug steeped in the decoction in the cavity of a hollow tooth. Dr. Gretchinsky considers his experiments proved decoction of buckthorn to be a reliable means for mitigating such dental pain as depends upon inflammation of the pulp. He recommends the decoction to be made by boiling 100 parts of the bark in water sufficient to yield 200 parts of the strained liquid and adding 10 parts of brandy. Another writer attributes the anodyne action to the powerful astringent properties of the decoction.—*Pharm. Jour.*

PHOTOGRAPHIC NOTES.

Blocking Out Negatives.—Mr. T. N. Armstrong, in the *British Journal of Photography*, says one of the best ways to block out the sky of a negative is to coat the glass side with a film of ground glass varnish, then after this is perfectly dry rub over it powdered black lead or graphite with a bit of soft kid. Any degree of density is readily obtained, and natural clouds in the sky of the negative may be easily strengthened.

Hydroquinone.—According to Leslie J. Montifiore in the same journal, hydroquinone, which has lately come into prominence as a developer for dry plates, is now manufactured very cheaply from coal instead of the cinchona.

Restoring Faded Albumen Prints.—H. Zandaureck recommends the following process, which we take from the *British Journal of Photography.* The faded and yellow print is well washed and then immersed in—

No. 1.

TONING BATH.

A	Distilled water.....	5000 c. c.
	Tungstate of soda.....	100 grms.
B	Distilled water.....	400 c. c.
	Chemically pure carbonate of lime.....	4 grms.
	Chloride of lime.....	1 grm.
	Chloride of gold and soda.....	4 grms.

Mix in a yellow glass bottle and shake well, let it stand twenty-four hours, then filter into another yellow glass bottle, which should be well corked.

For about a sheet of albumenized paper, take of solution A 150 c. c. and of solution B, 4 to 8 c. c. Then place the prints one by one into this bath.

About ten minutes is required for toning, especially if the bath is warm.

It is a good plan to have an excess of gold in the bath. It is said to give good purple tones.

No. 2.

FIXING BATH.

Solution A.....	150 c. c.
Hyposulphite of soda.....	15 grms.

The prints are carefully washed and placed one by one in the fixing bath, where they are left until their yellow color has entirely disappeared, which usually takes from three to five hours. After fixing wash carefully.

How to Tell whether a Sensitive Plate has been Exposed.—It happens sometimes that photographers forget to make a note of their exposures, and are uncertain whether plates have been exposed or not. Professor Karl Klauser, in the Philadelphia *Photographer*, gives the following simple directions:

Immerse the corner of the plate which you suppose to have received the greatest light, as, for example, the sky in a landscape, slantingly in a strong developer for an inch, or more for larger plates.

After a minute you will know if the plate has been exposed by faint traces of the sky, etc. In that case, proceed to develop your plate in the ordinary manner.

If no image will show, return the plate to the plate holder after having dried off the corner which you had immersed in the developer, with some blotting paper. The plate was not exposed at all, or else under-exposed. If impressed by too short exposure, a second exposure of longer duration will very clearly obliterate the first, especially of landscape work in shady places.

Photographing Interiors.—M. Victor Angerer, a celebrated Viennese operator, had to photograph a *salon* in Rothschild's palace. Independently of the difficulty imported by contrasts between the colors of the hangings, the furniture, and so on, another condition complicated the operation. The lens faced two windows in a circular wall, both admitting daylight. One of the windows was directly in front of the lens, and through it could be seen the church of Saint Charles.

M. Angerer solved the problem of producing his negative without solarization, and behold how:

He focused perfectly in full light, then he pasted black paper over the troublesome window, and he closed the second or lateral one by means of a double curtain, which permitted but little light to enter. The other windows in the *salon* gave the necessary light, but M. Angerer pasted white tissue paper over them to diffuse it. He then exposed in the camera a dry plate for "a day and a half," after having placed a minute stop in the lens. At the end of this time he supposed the plate to be overexposed, and he capped the lens. He then opened the curtains of the lateral window in the circular wall, after which he gave another exposure, but of fifteen seconds only, the same plate being still in the camera. He again capped the lens, and removed the paper from the front window, then he exposed the same plate once more, but for four seconds only. The effect was surprising. There was no trace of solarization, all was perfectly harmonious, and a special charm was given to the photograph by a sharply reproduced view of the church of St. Charles outside the embarassing window.—*British Journal of Photography.*

[NATURE.]

The Tarpon or Silver King (Megalops thrissoides).

The genus Megalops belongs to the family Clupeidæ, and, among other features, is characterized, according to Dr. Gunther,* by an oblong compressed body, the presence of a narrow osseous lamella attached to the mandibular symphysis and lying between the halves of the mandible. Further, the latter is prominent, the intermaxillary short, the maxillary forming the lateral part of the mouth. There are bands of villiform teeth on the jaws, vomer, palatines, pterygoid, tongue, and base of skull.

The interest in the species above mentioned has been considerably increased of late by the fact that the huge fish (between 5 and 6 feet in length, and weighing from 90 to 150 pounds) can be caught by rod and line, and I am much indebted to Lady Playfair for giving me all the information she had obtained on the subject through her father and Mr. W. G. Russell, of Boston, United States.

The tarpon (*Megalops thrissoides*) frequents the Atlantic shores of North America, and is especially found "on the western or Gulf coast of Southern Florida, haunting the shallow bays and creeks inside the bars and keys which stretch along that coast; and the fishes are supposed to enter by the passes from the outer Gulf.†

"In shape the tarpon somewhat resembles the salmon, but, as becomes one of the herring tribe, it is deeper and less rounded, and the head is larger, the scales (cycloid) are thick and large, more than an inch in diameter" (a fine scale sent by Lady Playfair measures 2¼ inches both in antero-posterior and transverse diameter), "and the exposed portion is of a bright silvery hue, indeed it looks as if it had been dipped in silver and burnished; hence the name 'silver king.' I have seen specimens weighing from 50 to 137 pounds, and have heard of none above 150 pounds.

"The tarpon has always been upon the Gulf coast, but was formerly captured, as the sword-fish is, by the harpoon. In 1885, however, a Mr. Wood undertook successfully to secure the fish by rod and reel. . . . About 150 have been caught in this manner during the seasons 1885 and 1886, the time being in March and April, perhaps a little earlier in a warm season; after April it is too hot for fishing.

"The fish is caught on the edge of the channels in 15 to 25 feet of water with a bait of (half a) mullet. The rod should be very stiff, not more than 9 feet in length, such as is used for large sea bass, and the line strong, but fine enough to carry 200 to 250 yards on the reel, which must therefore be large and heavy. A snood or gauging of about 3 feet of cod line, copper wire, or chain should be fixed to the hook,‡ as the dental apparatus of the fish efficiently combines a file and shears, with which even a double cod line may be frayed or worn off, or severed without a sensible strain.

"The tarpon takes the bait lying on the bottom, and moves off, swallowing it, until he is struck, and the moment he feels the hook he is out of the water, perhaps 3 or 6 feet in the air, shaking his head fiercely—as does the black bass—to disengage the hook, and then begins such a fight as, I believe, no other game fish ever shows. It frequently leaps with a clean breach twenty times before the game is over, and so close that it occasionally sends a douche over the boatmen; while in one instance a large one made a run of 100 yards, the whole of which was a succession of frantic leaps and plunges, leaving a wake like that of a steamer. The same fish towed my boat, with three men in it, about two miles, and, after more than an hour's hard fight, ended by three huge leaps out of the water among some mangrove trees, the oysters on the roots of which cut my line, so that we parted company after a close and protracted intimacy."

There is little doubt, from the foregoing remarks, that the splendid sport of tarpon fishing must make it most fascinating. In April, 1887, indeed, a single rod caught nine fish in eleven days, two of them weighing respectively 151 and 149 pounds, and in length 6 feet 4 inches and 6 feet 5 inches. These were taken at Punta Rassa on the western coast of Florida, the total weight of the catch being 1,042 pounds, or an average of about 116 pounds for each. The tarpon, like others of its tribe, has the advantage also of being good food.

W. C. MCINTOSH.

Indians Shoot at the Moon.

Four thousand blanketed Comanches, Kiowas, Cheyennes, Arapahoe, and Delawares were at the Anakee agency to get their rations when the recent total eclipse of the moon occurred. The savages were greatly excited. The principal chief ordered them to shoot at the "evil thing," and the force of Indians opened fire in the air, keeping up the shooting for upward of an hour, and until they were out of ammunition. When the moon appeared in view after the eclipse, wild whoops went up for what they believed to be their victory.

* "Introduction to Fishes," pp. 661-62.

† Extracted from a description (from personal observation) by Mr. W. G. Russell, of Boston.

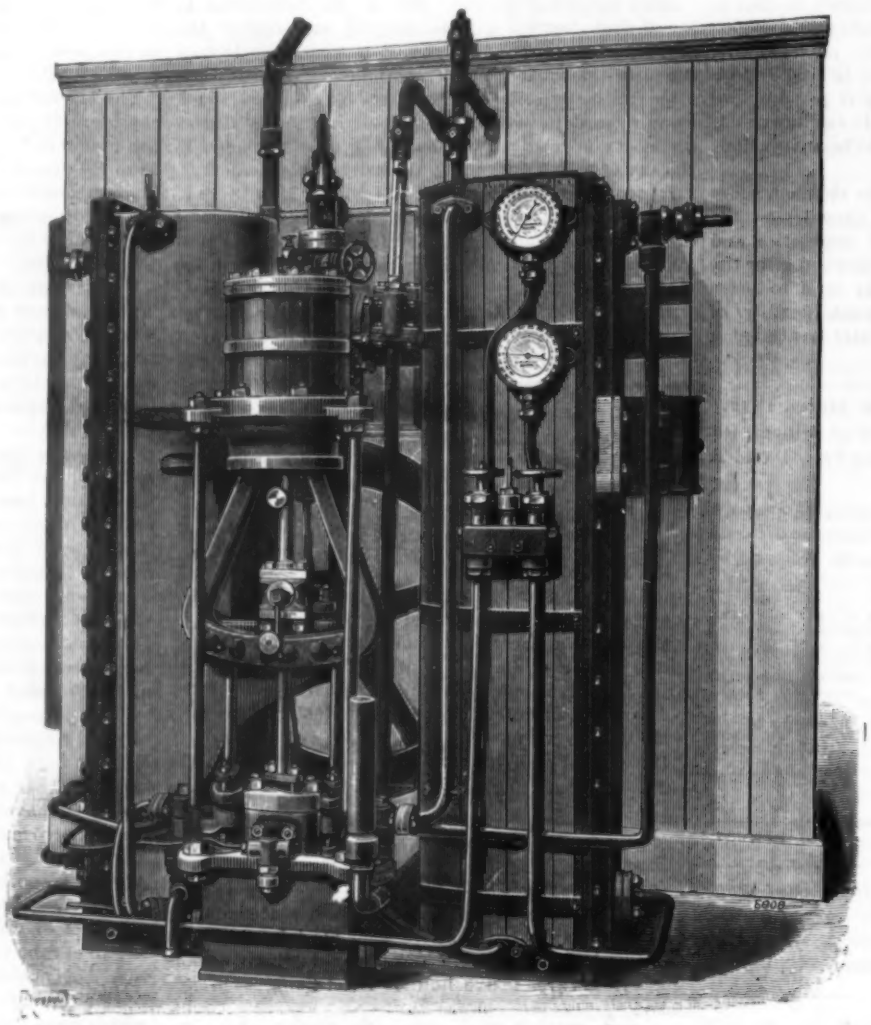
‡ Described elsewhere as "an O'Shaughnessy knobbed 10-0 hook."

IMPROVED REFRIGERATING MACHINE.

We give a perspective view of the refrigerating machine exhibited by Messrs. J. and E. Hall, of Dartford, at the Nottingham Show of the Royal Agricultural Society. In this machine, which is constructed under Windhausen's patent, carbonic anhydride is used as the working fluid, a material which can now be manufactured at a low cost, and which is not only non-inflammable, but incapable of supporting combustion, while in the small quantities in which it is used is not deleterious to health. In fact, at the Gambrinus Brewery, Charlottenburg, Berlin, the whole charge of a large machine (160 kilogrammes) was lately purposely discharged freely into the engine room, the doors and windows of which had been closed, but no inconvenience was experienced by the persons present, and candles placed about 20 in. above the floor remained burning.

The machine consists of a compressing pump which draws the carbonic anhydride from the refrigerator, and delivers it into the condenser, where it is cooled and its liquefaction effected, after which it passes again to the refrigerator, where it produces intense cold by its evaporation.

In the machine under notice the parts are very compactly arranged. The compressing pump is placed vertically and is driven direct by the prolongation of the piston rod of the steam cylinder above, while the condenser and refrigerator are also arranged vertically, the former being on the left and the latter on the right hand side, as seen in our engraving. As shown at Nottingham the machine cooled brine, which circulated in the refrigerating chamber shown on the rear.—*Engineering.*



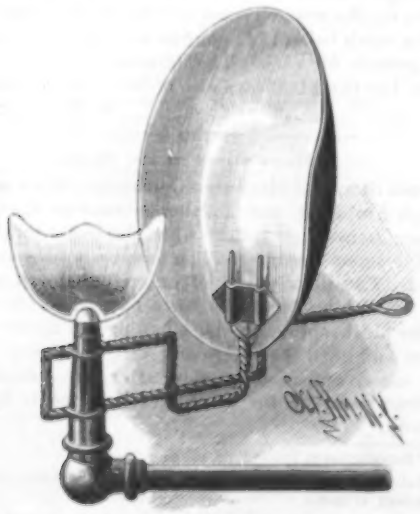
IMPROVED REFRIGERATING MACHINE

French Naval Ballooning.

Experiments with the marine captive balloon at Toulon, before referred to, have been continued. On July 21, Lieut. Serpette and his aide made another ascent in the early morning from the deck of the Implacable. The end of the pendent cable from the car was afterward taken by a launch on board the armorclad battle ship Indomptable, belonging to the evolutionary squadron in the roads, and two smaller balloons were then attached to the car, to serve as reservoirs for a further supply of gas, to meet the probable depletion in the larger machine. At 9 A. M. the Indomptable weighed anchor and steamed away to the southward, to soon disappear below the horizon, while the balloon remained in sight to mark the position of the vessel for some time afterward. The inspecting committee went with the Indomptable to ascertain the range of vision obtainable from lengthened distances at sea.

AN IMPROVED LAMP SHADE.

A simply formed and convenient holder for shades for gas jets, lamps, etc., preferably made of twisted wire, is illustrated herewith, and has been patented by Mr. Louis Michael, of Leavenworth, Kansas. In construction, the wire is bent at its middle to form a loop or hand hold, it is then twisted to a point where it is desired first to engage the lower portion of an ordinary tapering gas burner, where the twists are opened or spread, forming a lower loop, the twisted wires being extended and bent twice to extend horizontally back, the twists being again opened or spread, forming an upper loop to embrace the upper portion of the burner, after which the twisted wires are extended and bent as shown, being twisted twice around the lower arm, and separated at their upper ends to form prongs adapted to fit in bearings on the shade. The loops may be made smaller or larger, to fit different sized burners, or of a proper size to fit on different parts of lamps, and a special form of shade holder for lamps is also provided, in which the jaws are formed of spring or elastic wire to clasp around the lamp chimney or burner.



MICHAEL'S LAMP SHADE.

The Cheapest Pig Iron in the World.

We believe that the distinction of having the lowest record of cost belongs to the Ilsede Works at Grossilsede, Germany. The figures have been lately published by Fritz W. Luermann, a very well known engineer, in *Stahl und Eisen*, the data submitted being interesting also from a technical point of view, since they trace the effect of improvements in practice over a protracted period, both on increased product and lowered fuel consumption.

The works have three furnaces equipped with Gjers stoves, one stack always being in reserve, two blowing engines with 540 c. m. piston displacement per minute together, and three with an aggregate displacement of 1,460 c. m. The heating surface of the boilers is 2,053 sq. m. The ores are argillaceous and calcareous, from mines in proximity to the furnace plant, some of them being washed. Coke is produced now in 156 ovens at the furnace, the purchase of outside coke having steadily diminished since 1872, while the steam required has been raised almost entirely of late by the waste heat from the ovens, the quantity of steam being steadily decreased by improvements in machinery.

While the cost of ore has more than doubled since 1867, the output per day has been trebled, labor per ton has declined heavily and the cost of repairs and of materials other than ore and fuel has fallen to one-half. The general result is that the cost of pig iron has fallen from 41·96 marks per metric ton in 1869 to 23·01 marks in 1887, or, taking the mark at 24 cents, $10.23 per gross ton in 1867 to $5.62. It may well be questioned whether there is any other plant in the world which produces pig iron so cheaply. It is not surprising that under the circumstances the works declared a dividend of 20 per cent, especially since the product is particularly suitable for basic steel manufacture, the iron carrying 3·22 per cent of carbon, 2·92 per cent of phosphorus, 2·38 per cent of manganese, 0·049 per cent of sulphur, and 0·108 per cent of silicon, while the cinder analyzed 30·24 per cent of silica, 0·82 per cent of protoxide of iron, 11·90 per cent of alumina, 9·31 per cent of protoxide of manganese, 40·5 per cent of lime, and 1·9 per cent of magnesia. Mr. Luermann in reviewing these figures draws a comparison between the work at South Chicago and that at Ilsede in favor of the latter. At Ilsede the two furnaces produced in 1887, 113,997 metric tons of pig iron from 320,489 tons of ore and cinder and 11 tons of scrap. Deducting the latter, the yield was 35·57 per cent, the fuel consumption being 96,961 tons of coke, showing a charge of 330 pounds to 100 pounds of coke, in spite of low blast temperatures. He cites in comparison with this South Chicago, where the yield of No. 7 was 54·3 per cent of iron, but smelted daily only 368 tons of ore with 173·4 tons of coke, while Ilsede No. 2 worked daily 443 tons of ore, consuming only 134 tons of coke. The record of Ilsede stands 330 pounds of charge to 100 pounds of coke, as against 190 pounds of charge at South Chicago. We believe, however, that in the case of the former the ores were self-fluxing, while at South Chicago a considerable quantity of limestone must be added.—*Iron Age.*

A Sand Storm at Sea.

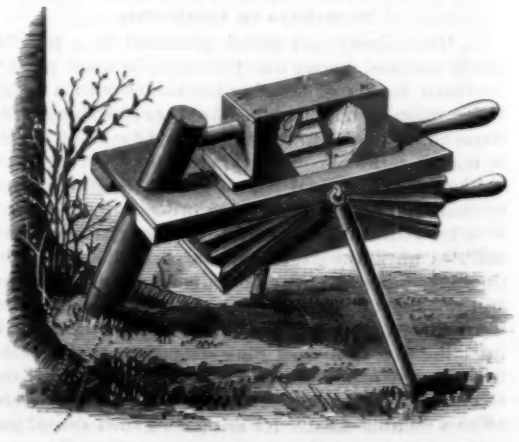
The British steamship Glenshiel, from the East Indies, recently arrived at New York, reports a sand storm which occurred on the evening of July 10, while the vessel was making for Suez. When half way up the Red Sea a most terrific sand storm, which lasted nearly ten hours, suddenly swept down. It was impossible to see anything a ship's length away. The wind blew a gale, and it was found to be a dangerous experiment to stay on deck for any length of time. The sand was hot, and when it came into contact with the body, would sting like the point of a knife.

A Wrinkle about Varnish.

Varnish made with alcohol will get dull and spongy by the evaporation of the alcohol, which leaves water in the varnish, as all commercial alcohol contains water. It is therefore advisable to take a thin sheet of gelatine, cut it into strips, and put it into the varnish; it will absorb in the thin sheet most of the water, and the varnish can be used clear and bright till the last drop. The gelatine will get quite soft; it can then be taken out and dried, and used again.—*Carriage Monthly.*

A FUMIGATOR AND ANIMAL EXTERMINATOR.

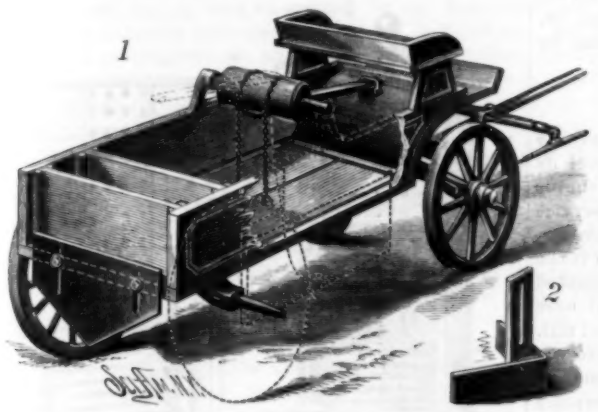
A device specially adapted for smoking out squirrels and similar animals, whereby the smoke and gases may be delivered directly into the animal's burrow, and not trouble the operator, is illustrated herewith, and has been patented by Mr. Amos Spitler, of Moscow, Idaho Territory. Upon a table having pivoted or hinged legs is secured a block, within which is a horizontal inverted U-shaped port, the lower openings of which communicate with passages from the bellows beneath the table. Intersecting the port is a recess, with a diaphragm constituting a valve for each of its outlets, the recess also communicating by a spring valve and horizontal channel with a cylindrical fire chamber, adapted to be held in any suitable manner in the forward end of the table, but projecting downward and outward, so that its lower end may be conveniently inserted into the burrow of an animal. Sulphur is placed in the cylinder, with leaves or straw, and the fuel lighted, when the lower conical end of the cylinder is introduced into the burrow and the bellows operated to supply air and drive the smoke out directly into the burrow.



SPITLER'S FUMIGATOR.

A DUMPING WAGON WITH ADJUSTABLE SCRAPER.

A wagon more especially designed for use in repairing roads, having hinged dumping bottom sections in combination with an adjustable scraper or leveler, is illustrated herewith, and has been patented by Mr. Wm. E. Hewlett, of Merrick, Long Island, N. Y. The bottom is centrally divided longitudinally, forming sections which are pivoted or hinged near the opposite sides of

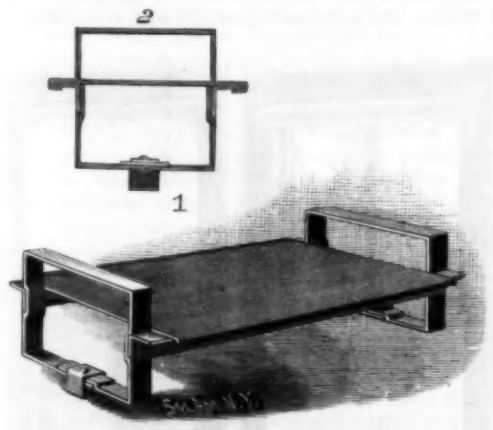


HEWLETT'S DUMPING WAGON.

the wagon body, chains attached to the inner edges of these sections being attached at their other ends to a drum on a cross shaft held above the wagon body. This drum has a lever that may be thrown downward in front and engaged with any suitable fastening to hold the bottom sections closed, or when released and allowed to swing back, as shown in dotted lines, the bottom sections are thrown down or open to dump the load. To level or spread the ridge-like heap thus deposited, a scraper or leveler is attached to the rear of the wagon body, which may be either in the form of a flat plate or board, tapering on its opposite edges toward the center, or it may be made in angular form, as shown in Fig. 2, adjustable up and down by one or more slots and bolts. Back of the main dumping bottom sections of the wagon, and at a suitable distance in advance of the tail board, a removable cross board is arranged, forming a convenient receptacle for shovels and picks, etc., or for other purposes.

AN IMPROVED PALLET FOR DRYING BRICK.

A pallet designed to afford improved means of piling brick in a drying kiln, whereby the brick may be protected and prevented from breaking, and a perfect circulation be obtained over and around them, is illustrated herewith, and has been patented by Mr. Charles T. Fitch, of No. 559 Morris Avenue, Elizabeth, N. J. The end pieces, or "heads," are formed of a single piece of metal bent to rectangular shape, their ends being united at the base by a rivet, while centrally in the sides is a depression, as shown in the transverse section, Fig. 2. The heads are connected by angle side strips, which are secured in the side depressions, a bench resting on the horizontal members of the angular side irons, and being held thereon by its turned-over edges. At the intersection of the ends of the head an angular strip is attached, by the same rivet that attaches the ends, the vertical member of the strip forming a locking lip, so that as one bench of bricks is placed upon another bench the locking lip will prevent lateral play. The several parts of the pallet are made of metal, and the



FITCH'S PALLET FOR DRYING BRICK.

side pieces and bench may be of any desired length, the bench being perforated if found desirable.

Population of Russia.

Government statistics recently published place the population of the Russian empire at 108,787,235, of which 81,725,185 are in Russia proper, 10,136,725 are in the other provinces of Russia in Europe, and 16,925,325 in Asiatic Russia. St. Petersburg is the most populous city, with a total of 861,303. The population of Moscow is 753,469, of Warsaw 454,293, and of Odessa 240,000.

Refining Olive Oil without Chemicals.

According to G. Seidel, olive oil is put into a conical tub provided with a steam coil. About ½ inch over the bottom, a faucet is inserted, to let off the water and impurities, and about 4 inches above this a second faucet is placed for drawing off the oil. The tube or tank may be made of any desired size, but that described by Seidel holds about 2,000 lb. It is placed upon a stone floor, and alongside of it are placed, at different levels, 5 to 6 clarifying tanks resting upon strong wooden frames. These tanks, which may also be of tinned iron, have a cylindrical form, a false perforated bottom about 1 or 1½ inch above the bottom, and above this, at the side, a stop cock. A layer of cotton, or preferably glass-wool, is placed on the diaphragm.

Glass wool is preferred as it may be easily washed and can be used for years, while cotton will last only for 2 or 3 operations. For every 100 lb. of olive oil to be clarified, 10 to 15 lb. of water are added. The oil is then brought to a boil, by means of steam, and kept so for 2 or 3 hours. It is then allowed to be at rest for 24 hours, during which time the water will separate. On opening the stop cock the partially clarified oil is allowed to flow into the first clarifying tank. When this is full, its contents are allowed to flow into the second, and so forth. When the first tank is empty, it may be refilled from the steam tank as soon as a new lot of oil has been treated as described above.—*Industriebl.*

AN IMPROVED RAILWAY SIGNAL LANTERN.

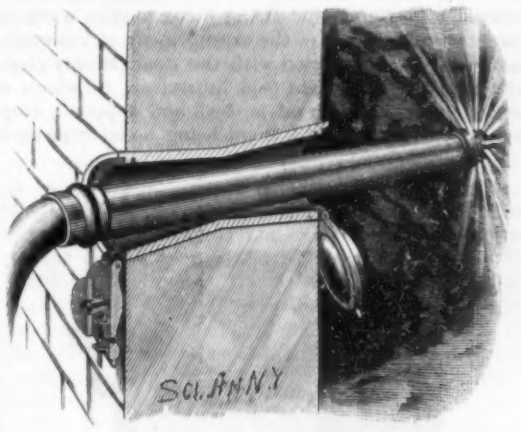
A signal lantern which may be used with advantage for block signals, to indicate when a section of road is

PETERS' RAILWAY SIGNAL LANTERN.

occupied, or to be used at crossings, and which can be readily operated by a train dispatcher or engineer, is illustrated herewith, and has been patented by Mr. Christian H. Peters, of Danville Ill. The upper part of the base casing has a collar for receiving a hollow glass cylinder, to the top of which is fitted a hollow cap, the cap and base casing being connected by bolts, to each of which is attached a plate for screening the bull's eyes not to be displayed. In a frame secured to the center of the base is pivoted a wheel having a flange on its upper surface for receiving a metallic cylinder, having several openings, preferably three, behind which are windows of different colored glass, the glass being bent to conform to the curvature of the cylinder. The wheel carrying the metallic cylinder carries also a pinion engaged by a toothed sector lever, pivoted at one side in the base casing, this lever carrying an armature that is drawn backward by an adjustable spring. An electro-magnet is supported by a bracket attached to the base in position to act upon the armature, and when the magnet is placed in a block signal line, and the circuit electrically closed, the armature is drawn toward the magnet, thereby turning the wheel and the metallic cylinder about one-third of a revolution. The cylinder contains a lamp, the light of which is colored by the colored glass windows, so that different signals may be displayed as the circuit is opened or closed.

A HOSE THIMBLE FOR WALLS OF BUILDINGS.

A tube or thimble adapted to be built into the walls of buildings, and through which a hose nozzle may be thrust for extinguishing fire, is illustrated herewith, and has been patented by Mr. Louis F. Stevens. The tube or thimble may be of brass, cement, or cast iron, and is preferably depressed in the center, with flaring ends, to facilitate the insertion of the hose nozzle, and also adapt it to be secured in the wall. Each end is provided with a hinged door having a spring-actuated locking bolt adapted to be operated by a key, while in the center of each door is a pin on which is adapted to slide a cone plate, so that when the plate is thrust forward on the pin, the cone will act to withdraw the locking bolt. When both doors are closed, all passage of air through the thimble is prevented, but in case of fire, and the outside door being opened by a key, the thrusting of the nozzle through the thimble against the cone plate automatically opens the inner

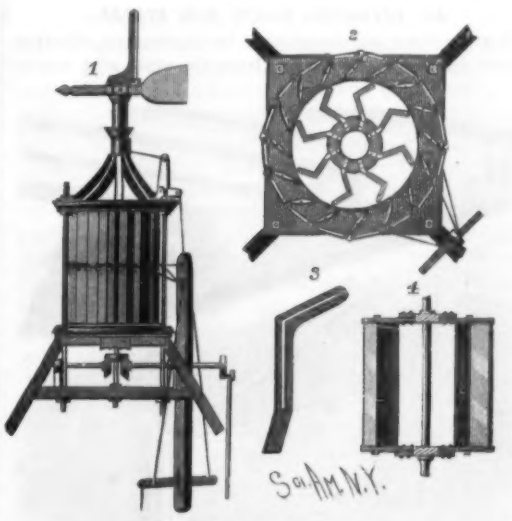


STEVENS' HOSE THIMBLES.

door. By this means the necessity of breaking holes in the walls of buildings to extinguish fire is avoided, and spray or distributing nozzles may be used to fight a fire at close quarters. For further particulars with reference to this invention, address Mr. L. F. Stevens, care of J. F. Donnell & Co., No. 822 Broadway, New York City.

AN IMPROVED WINDMILL.

A windmill having a wheel with angular wings inclosed in a casing whose sides are adapted to swing open and shut is illustrated herewith, and has been patented by Mr. Bernhardt Koeppe, of Kearney, Neb. In suitable bearings in the main frame is mounted to rotate a vertical shaft, carrying near its lower end a bevel gear wheel, by which the power is transmitted, the wind wheel secured to the shaft above having upper and lower grooved angular arms, in which are fitted plates forming the wings of the wind wheel, as shown in Figs. 2 and 3. The wind wheel is inclosed on its periphery in a casing, consisting of a number of sides that are diamond-shaped in cross section, whose edges are adapted to overlap each other when the casing is closed, so that no wind can get to the wings of the wind wheel, while permitting the easy entrance of the wind when the sides are opened. On the outer edge of each of the upright side pieces of the casing is a lug, a pivotally connected arm extending from each lug to the next following lug, and to one of the arms is secured a rope which passes under a pulley mounted on a post at the side of the main frame, as shown in Fig. 1, the rope extending upward and connecting, through a bell-crank lever, with the vane at the top. The construction is such that, with the casing open, the wind is guided by the side pieces to the angular wings of the wind wheel, so that its force may be most effectually utilized; but when the wind increases, causing the wheel to run above its normal speed, a lever connected with the vane exerts a pull on the rope connecting it with the arms pivoted to the side pieces of the casing, closing the



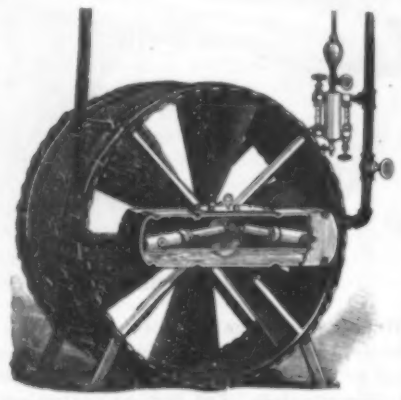
KOEPPE'S WINDMILL.

sides and shutting out the wind from the wheel. The sides of the casing can also be opened or closed by pulling a lever pivoted in convenient reach of the operator, ropes from which extend to the arms pivoted on the side pieces of the casing.

THE most effective show tablets for a chemist's window are opal glass with black lettering. Being translucent, they look as well by gaslight as by daylight.

WING'S HIGH SPEED ENGINES FOR FANS AND OTHER USES.

A neat, compact, and light engine, designed to be placed on the frame and shaft of a ventilating fan, where it can be run with little or no attention, is illustrated herewith, as applied to the Wing disk fans, made by the Simonds Manufacturing Company, of No. 50 Cliff Street, New York City. The engine is entirely incased, a portion of the casing being broken away in the illustration, to show the arrangement of the working parts. In connection with the steam supply pipe, at the right, is a sight-feed lubricator, in which a heavy, greasy cylinder oil is used, and supplied, drop by drop, with the steam, there being no oil cups used

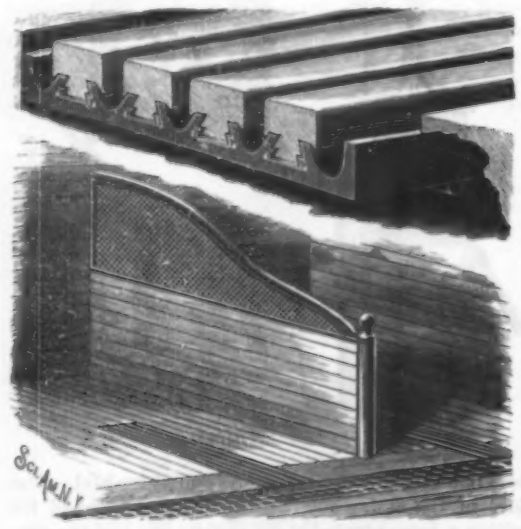


WING'S COMBINED FAN AND ENGINE.

in connection with the engine. The cylinders are single-acting, and hung on trunnions, oscillating with each stroke, as each piston communicates its impulses to a crank disk connected with the fan shaft. The exhaust is into the inside of the casing, in the bottom of which a considerable proportion of the discharged steam is condensed, the water bearing on its surface the oil that has been supplied with the steam, and in this way the lubrication of the parts is effected. The exhaust pipe leads from the middle of the casing, from the end opposite that at which the live steam enters, thus leaving a space across the entire lower half of the casing for condensed steam and oil. With the lubricator set to supply about six drops per minute, a perfect lubrication of the parts is, in this way, always maintained. The stuffing boxes and crank connections are tightened in the usual way, and it is not designed that the engine shall be separated from the fan, as they are both light and can be readily handled together. The fans require a comparatively small power to run them with the best effect. The blades are curved, and have an expanding pitch, thereby increasing the amount of air moved and reducing the slippage, while the blades are also adjustable to suit varying conditions. By its form and light weight the fan can be readily put in almost any position desired, and can be run horizontally or perpendicularly, while it is practically noiseless. For use in connection with the fan where parties have steam but no engine, or for running at night when the large engine is shut down, the small engine described admirably fills a most important need, being especially adapted for night drying in factories, heating and ventilating of all classes of buildings, and many other industrial uses.

AN IMPROVED DRAIN FOR STALLS.

A drain for stalls designed to be thoroughly effective, easily cleaned and detached from the stall, and not in-



LOGAN'S DRAIN FOR STALLS.

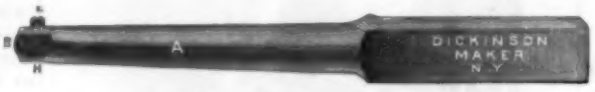
jurious to the feet of the stock, is illustrated herewith, and has been patented by Mr. Martin Logan, of No. 164 East Seventy-seventh Street, New York City. The floor of the stall is made with a flat central recess extending downward to the main floor of the stable, and to the general drain, and in this recess is fitted a metal drain having longitudinal side flanges and spaced longitudinal ribs, the outer faces of which are shaped to form gutters, the other faces forming essentially dovetailed grooves. Wooden slats are adapted to the contour of the grooves, in which they are slid, and firmly yet detachably held, the ribs having small horizontal lugs near the bottom corners on their forward ends, to make a stop for the outer ends of the slats, so that the animal cannot paw them from their position. The entire drain can be readily lifted out from the stall, or, from the peculiar shape of the gutters, they can be readily kept clean when the drain is in position.

A Chemical Water Level Indicator.

A convenient device for indicating the water level in wells, bore holes, etc., is described in the *Journal de l'Eclairage du Gaz*. It is recommended as a very simple process, and is employed by the engineers of the service of the Ponts et Chaussees for their new tide indicators. It consists in covering a small copper tube, which is the sounding instrument, with a sheet of paper impregnated with a solution of sulphate of iron, rubbing it over when dry with a pad dipped in powdered gall nut. The paper thus prepared takes, when plunged into water, a very pronounced black tint, in consequence of the reaction of the iron salt upon the tannin, forming ink. It is remarked that this process is susceptible of many modifications, and may find several applications in connection with gas apparatus. It is suggested, for example, that it could be used to record maximum pressures in water gauges, and in other hydraulic appliances employed in gas works. In the case of pressure gauges, to convert an ordinary gauge into a recorder of maxima it would suffice to insert a strip of sensitized paper into the branch communicating with the air. If, in consequence of the capillarity of the paper, the water line indications became a little confused at the end of a prolonged immersion, strips of parchment or parchmentized paper treated in the same way could be used instead of plain paper.

EUREKA DIAMOND REAMER.

This reamer is particularly adapted to the use of gunsmiths, gas engine and hydraulic pump makers. It is largely used by gas engine makers in Europe as well as in this country for truing the interior of cast iron and casehardened cylinders where a perfectly



EUREKA DIAMOND REAMER.

smooth, true surface is required. In the cut A shows the shaft, which is a tool shank for lathes. B is a circular bit in which the diamond, H, with semicircular cutting edge, is set and secured firmly in position by screw, E. The advantage of the circular bit is obvious, as the cutting edge can be revolved to suit the work by presenting new cutting surfaces when the other is worn. These points are also valuable for reaming out journal holes when indispensable to a scale. Additional particulars can be obtained by addressing John Dickinson, 64 Nassau St., New York, the well known manufacturer of diamond and carbon points.

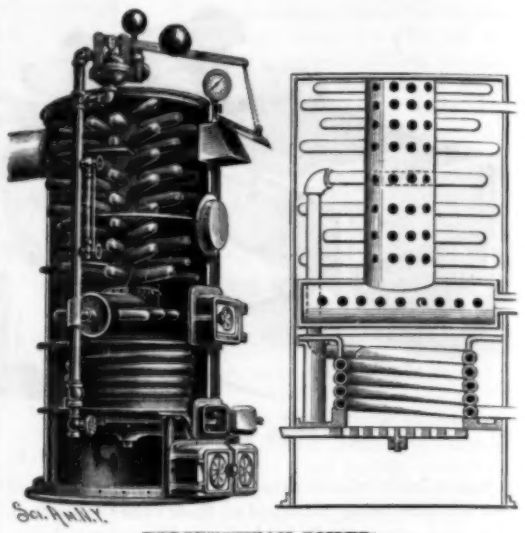
Protection from Lightning.

In his recent lectures on protection against lightning, Mr. Oliver Lodge said: "A wire netting all over the house, a good earth connection to it at several points, and a plentiful supply of that barbed wire which serves so abominably well for fences, stuck all over the roof, and you have an admirable system of defense. Now let us see how far most people agree, and where they begin to branch out and differ. The old and amusing political controversy between knobs and points has disappeared. Points to the sky are recognized as correct; only I wish to advocate more of them, any number of them, rows of them, like barbed wire—not necessarily at all prominent—along ridges and eaves. For a point has not a very great discharging capacity. It takes several points to discharge readily all the electricity set in motion by a moderately sized Voss or Wimshurst machine; hence, if you want to neutralize a thunder cloud, three points are not so effective as three thousand. No need, however, for great spikes and ugly tridents, so painful to the architect. Let the lightning come to you, do not go to meet it. Protect all your ridges and pinnacles, not only the highest, and you will be far safer than if you built yourself a factory chimney to support your conductor upon. At present the immediate neighborhood of a factory chimney or steeple is not a safeguard, but a source of mild danger."

TELEGRAPH poles are preserved in Norway by making an auger hole about 2 ft. from the ground, in which four or five ounces of sulphate of copper in coarse crystals are placed, and plugged in. The chemical is gradually absorbed by the wood, until its whole outer surface turns a greenish hue. The sulphate requires an occasional renewal, and is said to be a perfect preservative.

AN IMPROVED STEAM HEATING BOILER.

A wrought iron, portable, tubular boiler, for steam heating, with either high or low pressure, has been patented by Mr. Samuel P. Hedges, of Greenport, N. Y., and is illustrated herewith, one figure showing the internal arrangement, the casing being removed, and the other being a vertical central section. The fire box consists of an interiorly flanged ring upon which rests a coil of pipe, the upper end of the coil supporting a cap plate, and the interior of the fire box being preferably provided with a lining to prevent burning of the coil. Above the fire box is an inverted T-shaped stand pipe, tubes projecting horizontally from its horizontal member and radiating from the entire circumference of the vertical member. The upper end of the fire box coil is carried up at one side and connected with a branch pipe from the vertical member of the stand pipe at the water line, while its lower end is connected with a perpendicular supply pipe. There are baffle plates arranged upon each side of the stand pipe to compel the products of combustion to pass upward in a circuitous course, the products of combustion being utilized to the greatest extent while a constant and perfect circulation is effected, making this boiler a rapid and economical steam generator. These boilers are made in several sizes, and are tested up to 300 lb. cold water pressure.



HEDGES' STEAM BOILER.

AN IMPROVED WINDOW SHADE.

A shade which is made in sections, connected by cords, tapes, or other suitable strips, or by a square of gauze, and which is so constructed that it may cover the lower, the upper, or intermediate portions or the whole of the window, has been patented by Mr. George L. Castner, of Memphis, Tenn., and is illustrated herewith, one figure representing the tape connecting the two sections as it will appear when the lower section is drawn down to cover the lower sash, and the other showing the lower section of the shade covering the upper sash, the upper section and tape being wound around the roller. To suspend the lower section of the shade in position when it is desired to cover the whole window, the projecting ends of a rod or bar in its upper edge are adapted to rest in hooks on the casing at the sides, the connecting tapes then hanging down behind the shade. The shade may also be made in several sections, so that different parts of the window may be shaded, and a device is provided with which the supporting hooks at the sides may be arranged to be adjustable on a sliding bar.

CASTNER'S WINDOW SHADE.

MILK which has changed may be rendered fit for use again by stirring in a little soda.

THE NEW "TIMES" BUILDING.

Many of the old readers of the SCIENTIFIC AMERICAN, in all parts of the world, still remember its home in Park Row, New York, for so many years, and will not fail likewise to call to mind the handsome adjoining structure of the New York *Times*. The two buildings were erected in 1857, and the building occupied by the *Times* was one of the noticeably beautiful structures of the city at the time it was built. That it was also well built, and substantially fireproof, was demonstrated by the fact that it was unscathed by the fierce fire which so suddenly destroyed its neighbor, in February, 1882, and necessitated our removal to Broadway offices. This substantial and beautiful five-story structure is now, however, practically demolished, and in its place is rising one which will be thirteen stories high, our first page illustrations showing the decidedly novel method which has been followed in the demolition and rebuilding, with a view in perspective of the completed structure.

The ground space measures 96 feet on Nassau Street, 60 feet on Spruce Street, 102 feet on Park Row, and 104 feet on the line of the Potter building, which was put up with an extra thick wall on this side, to serve as a party wall between the two buildings. The "Potter," it should be noted, is the name of the recently completed building now occupying the site of the one where our offices were so long located, and is a thoroughly well built and fire proof brick structure, twelve stories high. Besides this space occupied by the *Times* building on the street line, a basement and sub-basement extend under the sidewalk 16 feet on Nassau Street and 20 feet on Park Row, while on the Spruce Street front there is a single basement, 30 feet wide by 90 feet long, of which the stone floor is 25 feet below the brick and iron arched ceiling which separates it from the sidewalk and street above. This is the *Times* press room, and has been maintained substantially intact, so that operations on the new building have but little interfered with the work done in this department.

The manner in which the outer walls, and sufficient of the interior, of the old building were removed, to make way for the walls of the new structure, while the floors were strongly supported to allow of the occupancy of the building, without interruption, for all the uses necessary in the publication of a great daily newspaper, are shown in one of the views, and the successful prosecution of this work without interfering with the business of the *Times* has furnished a novelty in the building line occasioning general comment. But it had been decided that it would be impracticable to move the business of the paper into new quarters, and therefore this novel plan of building was adopted, the work being undertaken by Mr. George B. Post, architect, and Mr. D. H. King, Jr., contractor and builder.

Work was commenced Jan. 23, the building being then fully occupied, and not to be vacated by any of its numerous tenants till May 1. Operations were therefore necessarily confined, at the first, to the laying of the new foundations, the walls of the old building being sufficiently shored up for this purpose. These foundations consisted of twelve piers on the three fronts and ten interior piers on the lines of three partition walls, which had formerly extended from Nassau Street to Park Row. The foundations of the piers on the street line are in each case nine feet wide, and in the case of the central one on Park Row, above which is the main entrance, the foundation is also 15 feet long. The site is a natural sand bed, and the piers, which are built of brick up to just below the sidewalk level, were each started on a bed of cement and broken stone three feet thick. The central piers, on the line of the partition walls in the old building, were to be used in the new building as foundations for iron columns carrying girders, the new structure not having any partition walls. These central piers, in three lines from Nassau Street to Park Row, are connected at their base by inverted arches, and they were extended sufficiently on both sides of the foundation of the former partition walls for each one of them to form the base for two iron columns, to be extended up, one on each side of the old interior walls, these columns being thus carried up in pairs, tied together with stiff plates on each floor, to the fifth story.

The work of building the new foundations, up to about the sidewalk level, had been substantially completed by the 1st of May, without apparently affecting the stability of the old building, or interfering with the regular business done in it. At this date, all of its numerous tenants removed to other quarters, but leaving about one-third of the building still occupied for the work of the daily business of the *Times*. For this purpose the whole of the fifth story had been used for typesetting and making up the forms, while the editors and reporters required the greater portion of the fourth story, the publication offices being on the ground floor.

On the 1st of May, work was first commenced in the public view, on the outside of the building, by the construction of a stout wooden bridge on its three fronts, the bridge being capable of holding several derricks, a hoisting engine, the heaviest blocks of stone, etc., and at the same time derricks were placed on the top of the building for use in removing and lowering the stone of the old walls. These had been built of an excellent quality of Nova Scotia freestone, and the stone was in almost perfect condition after its thirty years' exposure to the atmosphere. Some of the single stones weighed as much as 3½ tons. The old walls had been entirely removed by the 19th of May.

At the same time that the workmen commenced the removal of the roof and the old walls, a temporary roof was being provided inside the building, over the southern half of the fifth story and the entire fourth story, which were to afford the working rooms for the compositors, editors and reporters while building operations were in progress. This roof was of timber, covered with tarred paper and tin, and temporary board sidings, also covered with roofing paper, inclosed the various floors on the sides toward the street. The temporary accommodations thus provided, although not very inviting in appearance, and not so readily accessible as might be desired, have been quite sufficient for the carrying on of the daily work of the paper.

The floors of the old building were of arched brick and iron, but the iron beams did not rest on either the Nassau Street or Park Row walls, being supported on the south by the party wall of the adjoining building, and in the interior by the partition walls, resting on an outer wall only at the Spruce Street front. The removal of the side walls, therefore, and one or two of the brick arches and floor beams nearest them on the several floors, to give room for building the heavier walls of the new structure, did not immediately endanger the stability of the building. But, before the Spruce Street wall was removed, which formed the outer support of the last course of floor beams, the weight thereon had to be carried by supports from the interior. These consisted of a double line of shoring, 12 inches square, of Georgia pine, carried up from the basement, and built in form of a truss, in order that the weight upon it might be evenly distributed, and to prevent swaying. On each of the other floors were also double lines of heavy wooden columns, resting on beams laid from east to west, to act as floor supports, there having been from forty to fifty of these wooden columns on each floor. The interior of the old building was thus for a time entirely supported by the partition walls, themselves shored up by vertical lines of shoring from the basement up, and by the party wall on the south, independent of its three former outside walls.

The new building is of granite for the first two stories and of Indiana sandstone above. Commencing on the granite piers at the top of the second story, a heavy wrought iron hexagonal segment column is carried up in each pier opposite the old partition walls, on the Nassau Street and Park Row fronts. These columns form anchorages in the side walls, to which are secured cross girders, resting on the three rows of pillars extending from side to side in the interior, these girders forming the floor supports in place of the old partition walls. The floors of the new building being of the same height, respectively, as those of the old, it has been a simple matter, as the outside piers were carried up, and the vertical columns in line therewith on the inside, to transfer the load sustained by the shoring and the old partition walls to the girders designed to carry the interior weight in the building. The floor beams are similar to those used in the old structure, and most of these have been used in the new building, but, instead of the brick and mortar arches, a hollow brick is used to make a flat arch and corresponding flat finished ceilings.

The double iron columns resting on the central piers are only carried to the fourth floor on the line of piers nearest the Spruce Street front, while on the two other lines of piers these double columns reach to the fifth floor, single columns being carried up therefrom, in each case, for the several stories above. These columns, made of six plates each, rolled to shape as segments of a circle, with longitudinal flanges and solidly bolted together, are all exceptionally heavy, as are also the cross girders resting upon and strongly bolted to them and to the anchorages in the side walls. This plan of building also leaves each floor free from any obstruction, except such as made by the columns, affording ample light from the windows on three sides, while giving opportunity for the most advantageous subdivision of the room into various sized offices and business apartments.

The thirteenth story of the new building will be 23 feet from floor to ceiling, its windows looking out above the highest structures of the city on all sides, and its slate and iron roof pierced with several skylights. This story will be occupied, as was the top floor of the former building, by the composing room of the *Times*, and the 100 or more printers and proof readers there employed have reason to expect that, in the new structure, theirs will be the finest workroom of its kind in the world.

There will be three hydraulic passenger elevators, which, with the stairway, will be on the line of the party wall on the south, midway between Nassau Street and Park Row. The building will be always open, as work in a great newspaper office never ceases. A large proportion of the leading newspapers of the country also have offices in the immediate neighborhood of Printing House Square, the new structure being at the very focus of, perhaps, the most pronounced and most constant activity of any portion of New York City.

The rapidity with which the work has been pushed, from the day on which its prosecution first became apparent to the public, has been quite remarkable. The design is to have the new structure completed and ready for occupancy next spring. Work on it has, therefore, been continuous, with different sets of workmen, day and night, except on Sundays. The contract for cutting the freestone was not let till March, but there has been no apparent failure to keep the builders busy, although some of the stones have been very heavy, several of those in the granite piers weighing six to seven tons each. The iron work is all furnished by the Cornell Iron Works, of New York City. The possibility of accomplishing the work at all, however, and carrying on the publication of the paper on the premises at the same time, was due principally to the fact that the press room, under the sidewalk and street of the Spruce Street front, was substantially undisturbed by the building operations.

The *Times* is printed on five Walter presses, each printing from a continuous roll of paper, and each press occupying a floor space of about 8 by 12 feet. The power had been supplied by one engine, through the necessary belting and shafting, but this was found to be in the way of the builders, and in place thereof a small, incased, upright engine was placed near and geared to each press, a small pipe furnishing steam at about 70 lb. pressure, giving ample power, and the engines taking up so little room in each case as to seem almost a part of the press. These presses are capable of printing 20,000 copies per hour each, and this capability has been constantly maintained in the press room, notwithstanding the aspect of chaos prevailing above. The *Times* newspaper, therefore, has in no particular borne evidence of the somewhat remarkable conditions under which it has been produced while its old quarters were undergoing demolition and the walls of its handsome new structure rising above those of all its neighbors.

Wide Span Cables.

The plan for a great suspension bridge across the Hudson River, twenty-seven hundred feet in span, which is now under consideration before a government commission, and will probably be carried into execution if the commission does not disapprove it, is, it appears, far surpassed, at least in span, by certain telegraph cables, which have only their own weight to bear. In the Madras Presidency, in India, the River Kistna is crossed by a cable swung between supports five thousand and seventy feet apart, and one has just been put up in China, forty-six hundred and forty-eight feet in span. The versed sine of the curve formed by this cable is five hundred and fourteen feet. The whole weight of the suspended portion is only six and one-half tons, and the breaking resistance fifteen thousand pounds, so that there would seem to be no great difficulty, by building the supports high enough, in bridging almost any chasm by similar ropes, and establishing footways between them.—*Amer. Architect.*

New Line between Peru and Panama.

H. M. Brent, United States Consul at Callao, reports the establishment by Chili of a new line to Panama. The South American Steamship Company is a Chilian organization, based on a capital of $3,500,000 (silver), and receives a subsidy of $225,000 from the government of Chili on extending the service to Panama, and for carrying the mails. By a special understanding with that government, the larger vessels belonging to the company are to be placed in the national service in the event of war. The fleet of the company numbers eighteen large steamers, measuring 33,000 tons register, and provided with all improvements of the most modern class. The commanders are principally American and English, and men of recognized skill and experience. This company will make special efforts toward furnishing prompt communication and passage between Peru and the United States.

Cast Steel Shells.

The Pittsburg Steel Casting Company has produced at their works a cast steel shell, conical in shape, six inches in diameter at the largest end and tapering to a point two and three-quarter inches, including the opening at which the cap is placed. It has an elongation of twenty-one and one-fourth inches and weighs ninety-five pounds, requiring five pounds of powder for a charge, making the total weight 100 pounds. Fifty pounds of powder will throw the projectile a distance of six and one-half miles, and it will travel at the rate of 2,000 feet per second. The company has received an experimental order for 500 shells, which will be followed by one for 2,000.

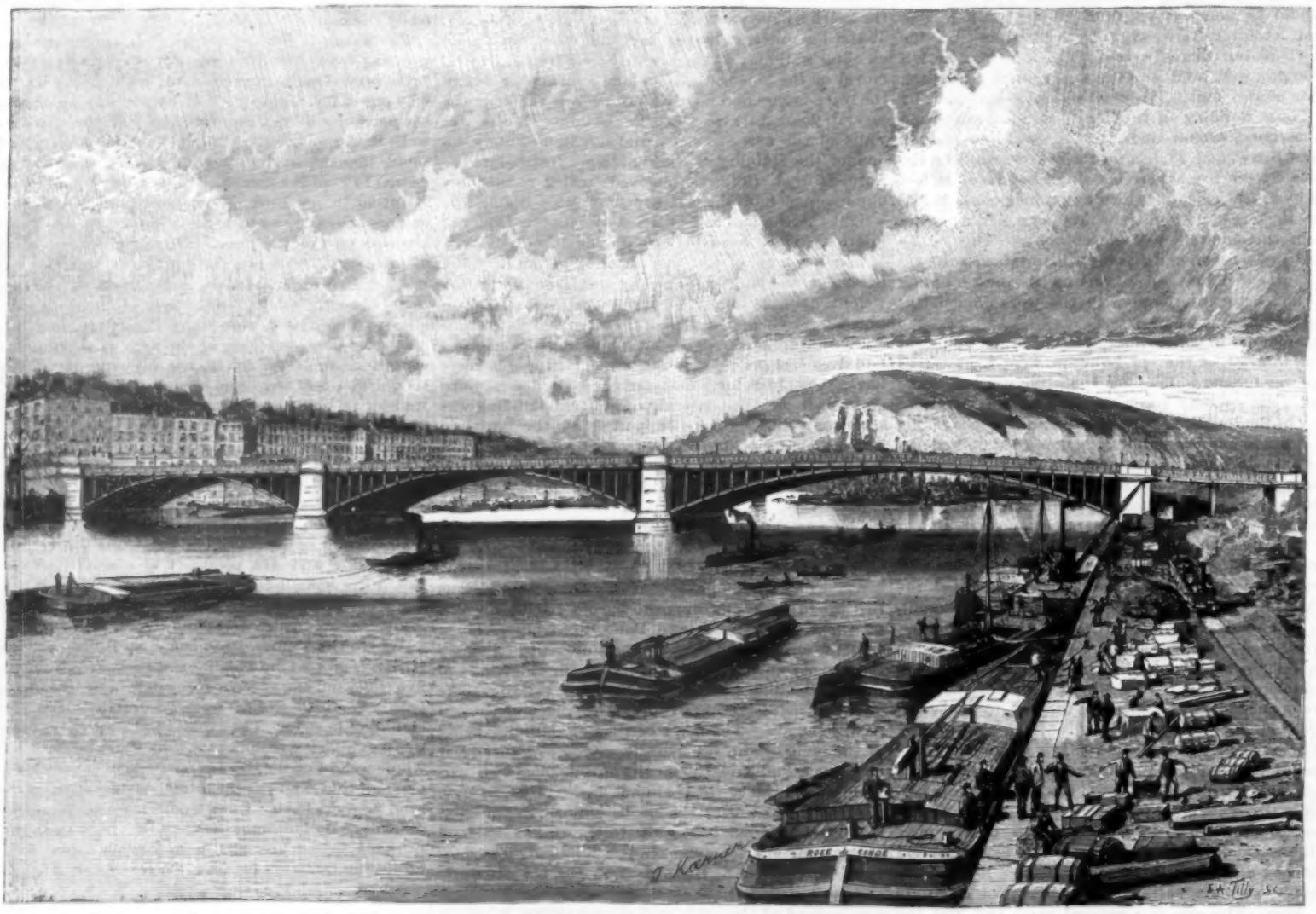
THE NEW ROUEN BRIDGE.

The great progress made in recent years in the manufacture of steel has permitted of employing this metal in work that was formerly done exclusively in iron. Although steel is harder than iron, it is also more brittle and less malleable. At present, it is possible to manufacture steel which presents the same advantages as iron, with a much greater strength. Under such circumstances, and with some boldness, it became possible to attempt the use of this metal in bridge building. This has just been done at Rouen, where the first bridge constructed of steel was opened to traffic on the 23d of June.

As shown in our engraving, the new bridge consists of three arches and a straight span on the left bank. The arches are unequal, on account of the necessities of navigation, and are respectively, starting from the right bank, of 40, 48·8, and 54·6 meters span. The entire width between railings is 20 meters. The steel arches are windbraced with iron. The railings are of cast iron. The bridge rests upon masonry piers built through the intermedium of compressed air, except the land abutment of the left shore, which is built upon piles. The whole rests upon a bed of marly clay, the surface of which is 14 meters below the lowest tides.

The construction of the bridge necessitated the use of 690,000 kilogrammes of steel and 585,000 of iron. The entire cost was 2,900,000 francs, not including 50,000 francs paid for the erection of a temporary foot bridge and the demolition of the old suspension bridge operated by a company which had the right to collect a toll of one centime from each person, and which was bought off for 1,120,000 francs.

The new bridge certainly does the greatest honor to the engineers who planned it—Messrs. Lavoinne and Juncker. The construction was undertaken by the Fives-Lille Society. The work was done under the superintendence of Mr. Porcher, acting under the direction of government engineers Mengin and Cadart.—*L'Illustration.*



THE NEW ROUEN BRIDGE.

Lime Water in Diphtheria.

Lime water is an admirable remedy in cases of diphtheria. Its local effect is most useful in cleansing and purifying the fauces, and its mode of application is the easiest imaginable. It requires no spray apparatus, no douching, and no effort at gargling. It is sufficient to have the patient slowly swallow a teaspoonful or more every hour, in order to get good results from its use. This fact is of the greatest importance in treating children, who are too often cruelly tortured in the attempt to make local applications to the throat. Lime water can be given easily, and is taken readily by children; and there are, we believe, few cases of diphtheria which require a more energetic local treatment than the one just described. In fact, we think that an early clearing out of the bowels with calomel—sometimes in massive doses—followed up after a short interval by the administration of lime water and the use of a suitable tonic and roborant regimen, constitutes a method which comes the nearest to being of universal applicability of any one with which we are familiar; and we think that the use of the lime water is of more consequence than any other part of the treatment, except it be the preliminary purgation.—*Med. and Surg. Reporter.*

Influence of Forests on Climatic Conditions.

Although scientists are not in perfect accord as to the influence that forests exert upon climatic conditions, nevertheless there is sufficient agreement among them for us to know that they do exert powerful and beneficent influences in many directions. The forest acts like a great sieve, and retains the fine particles of the soil, which the influence of the air and sun, the frost and rain, and the action of the numberless roots have decomposed. In all forest countries the changes of temperature are not so severely felt as in a treeless country or on the open plains, and it is a popular saying that the forest streams are cool in summer and warm in winter. The forests not only regulate the flow of water, but they purify it. Where the water of a stream has been polluted, as by sheep washing, for instance, after having passed for a few miles through a shady and dense forest, the water appears as clear as it was previously.

Again, it is thoroughly well established that the presence of large tracts of timber has a well defined influence upon the rainfall of the districts in which they are situated. Certain portions of France which have been denuded of their forests are subjected to disastrous floods and overflows, which occur almost annually and cause great destruction and distress, although such visitations were entirely unknown in the previous century while the forests were as yet intact. In our own country as well the same effects have been observed, and the destruction of forests has proceeded so rapidly in Prussia of late years that the government has passed a law protecting timber. It was found that the climate in many districts was changing, and rivers and lakes were becoming shallow in consequence of the wholesale cutting away of wood.

This feature of sylvan influence has been frequently adverted to in our columns, but there is another manner in which the presence of trees exerts an influence that is not so generally known. Close observers have ascertained that rivers running through treeless tracts of country are nearly, if not quite, destitute of fish, and that fish will desert a stream from which the timber has been removed, although they previously swarmed therein.

In the propagation of fish it is not enough to place the fry in the water, they must be provided with food, and the best means to do this is to preserve the border trees, and insure a steady supply of water and food by preserving the forests whence the supply of food is derived. If new forests are cultivated on the barren ranges, many a stream now nearly empty during the dry seasons will be refilled with fish and food for the many. We are rejoiced to see that of late the subject of the conservation and cultivation of forests is beginning to receive even a modicum of the attention it deserves. We write in the interest of an industry drawing its revenues from the forests, and we do not wish to look forward to a time when such revenues shall cease from lack of material to work upon.—*The Timberman.*

Economy as it is Understood at Panama.

A correspondent of the *Montreal Gazette* writes as follows: "I have referred to the shameful way in which valuable plant is used. Now, to cite a fact, to point a moral and adorn an 'o'er true tale.' Quite recently a new 4,000 kilo. *grue*, or movable crane, went off the line near the Culebra cut. They cost $2,500 each. Down the slight embankment it went. The intelligent foreman of that section, instead of making any effort to recover it, simply buried it by ordering in a train of dumping cars. The crane was buried and remains buried. Its burial simplified the whole matter. It was not his, and the company had dozens idle. Words fail to convey any idea of how machinery has been used there. An engineer told me that three-fourths of the $30,000,000 worth of machinery on the Isthmus is rusting and much of it is useless, valueless even as old metal, owing to its location. The canal company takes credit for $30,000,000 worth of machinery on the Isthmus."

The Bendego Meteorite.

This famous mass of iron was landed in Rio de Janeiro June 15, and is now in the national museum of that city. The transportation over 115 kilometers of mountainous country to the nearest railroad station was directed by Chevalier Jose Carlos de Carvalho in the name of the *Sociedade de Geographia de Rio de Janeiro*, the necessary funds, amounting to about $10,000, being generously furnished by Baron Guahy. The weight verified on the scales of the Bahia R.R. is 5,361 kilogrammes. The comparative thickness of the crust of oxide formed since the first attempt to remove it in 1785, and that found in the original resting place, afford a basis for a rough guess at its age, which may safely be put down as over six centuries.—*Amer. Jour.*

SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

Although there is no shorter or quicker route for the descent of a falling body than that of a plumb line, it has been shown that a body projected horizontally with whatever force, and describing a long trajectory, will reach the earth in exactly the same time as another similar body simply dropped from the same height. There are many simple and ingenious devices for demonstrating this fact. If the experiment could be brought within convenient compass for observation, nothing would be better for the purpose than an ordinary gun, with powder as the propelling power, but this is of course out of the question. It is therefore necessary to resort to apparatus which may be used in an ordinary room, so that both projected and falling ball may be seen and heard. The apparatus is still a gun, but a very harmless and inexpensive one. It is a modified "Quaker gun," a well known toy used for shooting marbles.

Fig. 1 is a perspective view of the gun, showing it immediately after its discharge, and Fig. 2 is a longitudinal section showing the gun ready to be discharged. The gun consists of a wooden barrel chambered at the muzzle to receive the marble and provided with a rod attached to the breech piece, extending into the barrel and arranged to be propelled forward by a strong elastic rubber cord stretched over the breech piece, with its ends nailed to the sides of the gun barrel.

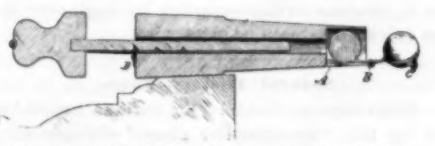


Fig. 2.—LONGITUDINAL SECTION OF GUN.

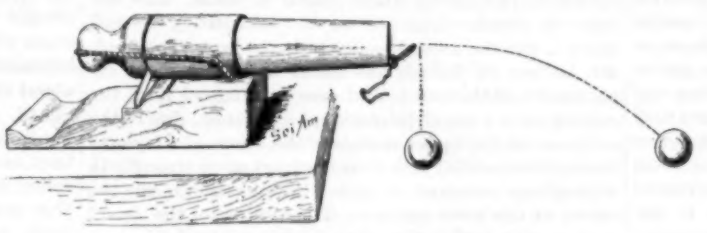


Fig. 1.—FALLING AND PROJECTED BALL.

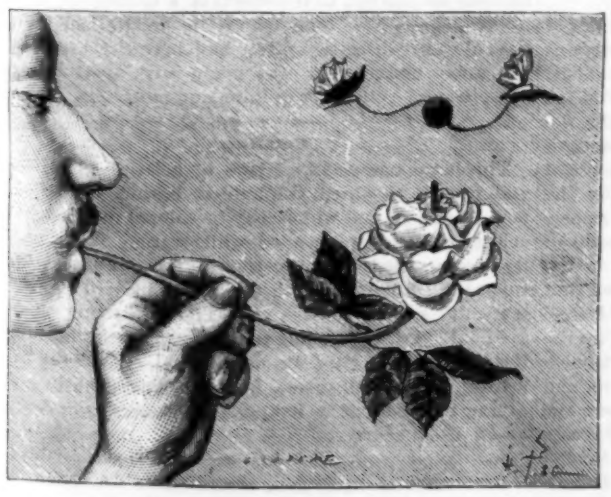
Two changes only are required to adapt the gun to scientific use. First, the notching of the rod passing through the barrel and the application of the trigger, D, for engaging the notches, and second, the support for the falling ball at the muzzle of the gun. The trigger, D, is merely a strip of sheet metal pivoted to the end of the barrel by an ordinary screw. In the muzzle of the gun at the under side is formed a slot, A, and in the end of the gun on opposite sides of the slot are inserted eyes, B. In these eyes is journaled a wire support, C, which supports the ball to be dropped at one side of the muzzle out of the path of the projected ball. The wire support, C, forms a lever, one end of which projects into slot in the barrel and is held by the ball in the muzzle. When the rod in the barrel is liberated by pulling the trigger, D, the ball in the muzzle is projected, thereby releasing the wire support, which immediately turns and allows the other ball to drop. It will be noticed that both balls reach the floor at exactly the same time, without regard to the amount of force applied to the projected ball.

The falling ball is impelled by the force of gravitation only. The projected ball is acted upon by two independent forces—the force of gravitation, which draws it toward the earth, and the projecting force, which tends to move it in a horizontal line. The projecting force is concerned only in carrying the ball horizontally forward, and does not in any way interfere with the action of gravitation, but gravitation brings the ball gradually nearer the earth, until it finally strikes, the force with which it strikes being the resultant of the two forces acting upon it.

THE MAGIC ROSE.

All our readers know the experiment which is familiar to rifle and pistol marksmen, and in which an egg shell is made to remain in equilibrium at the top of a jet of water. A very light ball of cork, or even a pellet made of bread crumbs, is capable of resting in equilibrium in a current of air, and the method of performing the experiment we have already given in a preceding number. One of our readers, Mr. Martinaud, an electrician, sends us, under the name of the "magic rose," a charming little device based upon the same principle. The apparatus is not new, but is none the less interesting, and is not much known. The artificial rose, which is of paper, is traversed by a metallic tube that forms its stalk. This tube, on the one hand, extends slightly beyond the petals of the flower, and on the other is prolonged in such a way that it can be held in the mouth, the flower being at a distance of about ten inches from the eyes.

If the tube be blown into regularly, and a small elder pith ball, to which two artificial butterflies are affixed by slender wires, be placed over the flower, the ball, when well centered in the current of air, will remain suspended therein at an inch or so from the flower. As the current of air is invisible, the effect produced is very surprising, and the butterflies, incessantly in motion, appear to be engaged in rifling the flower of sweets, after the manner of living ones.



THE MAGIC ROSE.

It sometimes happens that the ball revolves in the current and carries along the butterflies, which thus describe a circumference around an axis. It is unnecessary to say that the blowing must be done with great regularity.—*La Nature.*

Blisters on Panels.

This is a subject which has puzzled a great many, and various have been the different explanations given concerning the cause and remedy; we propose among the others to give what we believe is one great cause, and that is the direct influence of the sun's rays. We have noticed that in nearly every instance the blisters show themselves during the summer months. We have also noticed that immediately after a shower, when the carriage has been exposed to the rain and then left standing with great drops of water on the panels, the danger is greatest, although the theory has been that the shower has cooled them off; we think different, in at least this respect. The rain may have cooled the great body of the surface off, but where the spots of water are allowed to remain, and the full force of the sun is brought to bear upon them, they are then converted into what might be called suctions; the heat is in a measure concentrated into a small surface, which in the act of drying draws the softened paint up into what we call blisters; that is our opinion, formed after some little observation.

After the blister is once allowed to dry, there is no way to get it down; any attempt to do so would break it off, as it then becomes brittle, exactly as it does when you blister with the iron or lamp when burning off. In this case, if taken in time, it has this advantage over the other: it is not burnt paint as the other is, but simply softened up and drawn; it looks as though it was twice as large as the other, but in reality is not; by simply pressing down on it while it is hot you can restore it to its place, of course with the loss of considerable of its luster; it will naturally show where it has been, but will not be a blank space, as it would be if allowed to flake off. Another way blisters are liable to form is to allow the job to stand either in the coach house or shop near a window; the sun is very likely to form a focus on some of the panes, and, striking on the panels of the body, or, as in some cases, on the carriage parts, the rays are concentrated on one particular spot, acting just as though it was what in our boyhood days we used to call a burning glass.

The safest way to guard against all danger is, be careful about how the carriage is subjected to either the rain or heat. If caught in a shower, have a chamois skin with you; it will not take very long to dry the surface off, and then you are sure you are running no risks. If compelled to stand any length of time in the sun, turn the carriage around once in a while, so as to allow the sides to cool alternately. The danger is not near so great when the painting has been done properly on the job. Never allow the carriage to stand in the coach house near a window, unless you have a cover for the exposed parts, or curtains on the windows, and above all do not cool your carriage off too suddenly while it is heated, by dashing water over it in that condition; let it cool off gradually by standing in a shady place, or at least until you can bear your hand on it without almost burning it. The reason is that the varnish and paint is softened up so that the sudden reaction will be very likely to cause it to crack, if not to flake off altogether. Water should never be allowed to dry on a carriage, either by the action of the sun or atmosphere, but should be dried off with a chamois.—*Carriage Monthly.*

The Coolest Town in the World.

In the Berlin *Meteorologische Zeitschrift* for June, so says *Nature*, Dr. Hann gives an interesting account of the winter temperature of Werchojansk (Siberia), deduced from several years' observations. The town, which lies in the valley of the Jana, about 9 feet above the level of the river, in latitude 67° 34′ N., longitude 133° 51′ E., and at a height of about 350 feet above the sea, has the greatest winter cold that is known to exist upon the globe. Monthly means of —58° F. occur even in December, a mean temperature which has been observed nowhere else in the polar regions; and minima of —76° are usual for the three winter months (December-February). In the year 1886 March also had a minimum —77°, and during that year December and January never had a minimum above —76°, while in January, 1885, the temperature of —89° was recorded. These extreme readings are hardly credible, yet the thermometers have been verified at the St. Petersburg Observatory. To add to the misery of the inhabitants, at some seasons the houses are inundated by the overflow of the river. The yearly range of cloud is characteristic of the climate; in the winter season the mean only amounts to about three-tenths in each month.

Artificial Emeralds.

At a recent session of the French Academy of Sciences, Mr. Daubree, in behalf of Messrs. Hautefeuille and Perrey, presented an interesting note on the production of emeralds. These learned chemists have succeeded in producing very beautiful crystals of emerald by fusing silica, alumina, and glucina (with traces of oxide of chromium) with acid molybdate of lithia. The materials were heated to a temperature of from 600° to 700° for fifteen days.

There were obtained 15 grammes of small crystals of about a millimeter, having all the mineralogical and physical characters of the natural emerald. The longer the operation is continued, the larger the crystals become.—*Annales Industrielles.*

THE MAGIC ROSE BUSH.

In lectures on chemistry, the professor, in speaking of aniline colors, in order to give an idea of the coloring power of certain of these substances, performs the following experiment:

Upon a sheet of paper, he throws some aniline red, which, as well known, comes in the form of iridescent crystals. He shakes the surplus off the paper into the bottle, so that it would be thought that nothing remained on the paper. If, however, alcohol, in which aniline colors are very soluble, be poured over the paper, the latter immediately becomes red.

This experiment may be varied as follows: Instead of scattering the aniline over paper, it is dusted over the flowers of a white rosebush, and the flowers are shaken so as to render the dust invisible, and then, when a visit is received from an amateur of horticulture, we tell him that we have a magic rose bush in our garden, the flowers of which become red when alcohol or cologne is poured over them. The experiment is performed with the aid of a perfumery vaporizer, and the phenomenon causes great surprise to the spectators who are not in the secret.—*La Nature.*

THE MAGIC ROSE BUSH.

India Rubber.

At the recent Manchester exhibition Charles Macintosh & Co., of that city, made an exhibit divided into two parts, one of which is devoted to the origin of India rubber and the various materials used in its manufacture, and the other to the processes of manufacture of finished articles. Professor Watson Smith says:

Probably no exhibit illustrating the India rubber industry has ever before been shown of so complete a kind.

The articles exhibited are the entire trunk of an India rubber tree (*Siphonia elastica*), specially obtained from South America, and from which fine Para rubber is obtained. It is a tree inhabiting dense forests on the banks of the Amazon and several of its tributaries, where it is called the "*Seringue*." The chief district from which its caoutchouc is obtained is, according to Wallace, the country between Para and the Xinqui River. The "*Siphonia*" species comprises trees varying from twenty-five to upward of one hundred feet in height, and all contain a milky juice in more or less abundance, though they do not all yield caoutchouc of good quality, that from some of the species being brittle. The fruit is a rather large capsule, composed of three one-seeded pieces, which split in halves when ripe. The raw seeds are poisonous to man and to quadrupeds, but macaws eat them greedily, and they are an excellent bait for fish; long boiling deprives them of the poisonous principle, and renders them very palatable. The bulk of the caoutchouc exported from Para, whence our chief supply comes, is obtained from *S. brasiliensis*, which is the one common in the forests of the Province of Para, but that brought down the Amazon and Rio Negro is derived from *S. lutea* and *S. brevifolia*. The thin white milk is obtained by making incisions in the trunk, from which it exudes. The trunk exhibited is thus punctured, and a pocket-shaped receptacle of clay has been attached just below the puncture so as to represent the way in which the milk is caught. This clay receptacle is furnished with a lip, so that the milk overflowing may be caught in the earthen vessels used by the native workpeople.

This clay receptacle to the tree holds about a tumblerful, and it requires about three hours to fill if the tree be fruitful; this will give an idea of the rate of flow. When the first cutting ceases to yield, the natives make a second one lower down, and so on until they have exhausted the milk in the tree, which is done by making in all four incisions, all at equal distances. They then pour the milk into larger vessels, gather heaps of Urucari or Inaja nuts, which yield a thick oily smoke, and set them on fire. Now they begin the manufacturing process by covering the wooden forms for sheets, long and flat bottles, etc., with clay (so as to be able to detach the rubber easily afterward), dip the forms into the milk, and hold them over the smoke. As soon as the milk is dry, they dip them a second time, and so on till the rubber is of sufficient thickness, they then take it off the form, and it is ready for exportation.

A tree cannot be again made use of for two years, as it requires that time to recover its exhausted strength. A section of a rubber tree is shown, measuring about 18 inches in diameter, also a bottle of the white milk brought from Para, and now coagulated. The actual trunk of the tree is so arranged as to appear to form the foreground of a picture in which the scene is completed in a very ingenious manner, as a painting, the foliage of the trees being represented, the natives at work curing the rubber, carrying the milk, etc.; a small sapling (*Ficus elastica*) actually growing, and planted close to the picture referred to, assists still further the imagination of the visitor. Specimens of the Urucari nuts are shown, and also of crude rubber as imported—fine Para, negro head or Sernamby, Mangabeira, and Ceara.

In the other parts of the exhibit are three other pictures portraying all the details of the native work—the collecting of the rubber from the trees, smoke curing, a rubber collectors' settlement, and a river boat. An actual specimen of such a boat, made of rubber, is also to be seen. Specimens of washed Para rubber, pure solid rubber block, and fine cut sheet used for making tobacco pouches, elastic bands, surgical bandages, etc., are shown, along with drugs, chemicals, and pigments used in the manufacture of rubber goods. Very interesting also are the six specimens illustrating the products of destructive distillation of caoutchouc.

Elastic Rubber Thread.—The manufacture of this is one of the most important branches. This thread is used for weaving with silk or cotton into elastic webs for boots, braids, and other articles of dress. Among these threads are some exceedingly fine vulcanized varieties shown by this firm. A considerable variety of articles used for mechanical purposes is shown, and also a convenient form of matting recently introduced, which is finely ribbed. It is used as floor cloth, and presents several advantages in such use; it is styled "Rabdotos." There are also waterproof and airproof fabrics and all varieties of garments, mattresses which can be used on board ship, and, by being inflated, will, in case of necessity, serve as rafts. A camp equipment is shown, consisting of bed, air mattress, folding bath, and bucket, playing balls, Macintosh tennis balls, and elastic bands.

The works of this firm were first established in 1824 by Mr. Charles Macintosh, who first applied India rubber to the warterpoofing of articles of clothing, whence the term "Macintosh." The processes used to render rubber non-adhesive and insensible to cold, usually termed vulcanization, are the invention of Mr. Thomas Hancock, one of the members of the firm. The effect of vulcanizing is also to make the rubber permanently elastic, as well as insensible to cold or heat, besides resisting largely the dissolving action of oils or fatty matters. Vulcanization has enabled rubber manufacturers to produce articles applied by engineers in machines driven by steam or otherwise.

Natural History Notes.

The Resurrection Plant.—The curious property possessed by the "resurrection plant" (*Selaginella lepidophylla*) of curling up into a ball in a dry atmosphere and uncurling when placed in water, like the rose of Jericho (*Anastatica hierochuntina*), is well known, but the cause has not hitherto been explained. Mr. Leclerc du Sablon has made a microscopical examination of the plant, and has determined that the curling up is a purely physical phenomenon, due to the existence in the upper surface of the stems of a layer of short, thick-walled cells that contract more strongly in drying than others which form a thinner layer inside the cortex of the lower surface. The curling of the frond that occurs is therefore very similar to the dehiscence of the spore cases in the nearly allied order of ferns. The curling up of *Selaginella lepidophylla*, however, differs from that of the rose of Jericho in the fact that in the latter the object appears to be to protect the seeds, the rolling along of the plant by the wind serving to carry the seeds to a distance in safety, the plant, meanwhile, losing its vitality. On the other hand, the selaginella preserves its vitality, even in a dried state, for a considerable length of time, not only expanding, but sending out roots when placed in a sufficiently moist situation. Mr. Du Sablon shows that this property is due to the fact that the thick-walled cells contain a dense, opaque protoplasm, such as is present in the cotyledon or albumen of some seeds. This protoplasm is further protected by the thick membrane of the cells from external influences of temperature, etc., so that the plant can easily assume a state of active vitality under conditions similar to those under which seeds germinate.

Cause of Chameleon Changes.—If we take three pieces of glass, and distribute over one several small drops of brown paint, by pressing on this with another glass the drops are spread out, giving to the whole glass a delicate brown tint. If we now separate the glasses a little, the paint collects in drops, and the tint partly disappears. If we take the third glass and place on it a few drops of green paint, and then press it against one of the others, a green tint will show through the layer of brown dots. The skin of the chameleon is, roughly speaking, made up of three such layers, with dots of pigment called chromatophores between them. These dots may be contracted or spread out in thin layers, the resulting color depending on the color of the chromatophores affected. The power of adapting color to surrounding objects is known to naturalists as "protective resemblance," and many cases of it are to be found in both the animal and the vegetable kingdoms.—*The Swiss Cross.*

Receptacles of Secretion in Plants.—Two methods of formation of the cavities containing oils and oleoresins in plant tissues are generally recognized by botanists. In one of these, to which the term "lysigenous" is applied, the cavity is supposed to be formed by the destruction or absorption of a certain number of contiguous cells, and in the other, or "schizogenous," mode of formation, the cavities are said to be formed by the separation of neighboring cells, leaving an interspace. Authorities vary in their opinions as to the mode of formation in the same plant, as, for example, in the rue (*Ruta graveolens*), in which it has been stated that the cavities are first schizogenous and ultimately lysigenous. Mr. Leblois, with the object of clearing up the difficulties thus created, has undertaken a lengthy examination of plants of different natural orders, and has arrived at the conclusion that in all cases the origin and mode of development of oil cells and receptacles of secretion are the same. The oil cell is formed by a mother cell dividing into four cells, which leave a line of separation. These cells, by subsequent divisions, increase the size of the cavity. When several contiguous cells act in the same way, a secretory canal or a long instead of a round cavity is formed. He also points out that the layer of cells immediately surrounding the oil cavity appear to have a protective function.

The Pottery Tree.—Among the useful vegetable productions of Brazil may be mentioned the pottery tree, *Moquilea utilis*. The wood of this tree is very hard and contains a very large amount of silica, not so much, however, as the bark, which is largely employed as a source of silica in the manufacture of pottery. In preparing the bark for the potter's use, it is first burned, and the residue is then pulverized and mixed with clay in varying proportions. With an equal quantity of the two ingredients, a superior quality of ware is produced. This is very durable and will stand almost any amount of heat. The natives employ it for all manner of culinary purposes. The bark, when fresh, cuts like soft sandstone, and the presence of the silex may be readily ascertained by grinding a piece of the bark between the teeth.

An Elephant Funeral.—The *St. James Gazette* prints the following letter from a planter in Ceylon, giving a remarkable account of the removal of the body of a dead elephant by its comrades of the herd:

"I went after a herd of eight elephants, and came up with them about 3 P.M. After stalking I got a chance at the one which seemed about the biggest of the herd, and dropped it at the first shot. It turned out to be a big cow elephant. About two hours afterward I had the tail and feet cut off and taken to the bungalow. Next morning I went to the spot to look at the elephant and found her, or what remained of her, *non est*. After looking around, I saw the herd had been around during the night, and I soon discovered a track where they seemed to have retired in a body. I followed this through a thick bamboo jungle, and about 500 yards further on, I came upon the dead elephant, lying in the bottom of a rocky stream. Judging from appearances, the body of the elephant had been carried to the top of the bank, and from there rolled into the stream. From the tracks, it was plain that the body had not been rolled, but carried to the bank, and it was plain that it had been rolled through the managrass, which grows on the sides of the stream. The jungle through which the body was brought to the stream was very heavy, with bamboos growing close, and the track which the elephants made was several yards wide. Some surprise was expressed at the circumstances by my neighbors till I showed them where the elephant had been shot and where its tail and feet had been cut off, and where the body lay in the stream, which proved conclusively that by some means or other the body had got over the intervening space in the night." It is difficult to understand how elephants with their trunks and feet could raise and support the dead body of a comrade. However, they seemed to have managed it.

Meta-Sulphite of Potash.

This salt has been recommended as a substitute for sulphite of soda in preserving pyrogallic acid in solution. This salt is $K_2S_2O_5$, while bisulphite is $HKSO_3$, and is prepared by supersaturating a rather strong solution of carbonate of potash with sulphurous acid and precipitating with absolute alcohol. A white acicular mass of crystals is obtained which must be collected on a filter and washed with absolute alcohol. The salt has an unpleasant sulphurous taste, is neutral to test paper, and slowly evolves sulphurous acid in the air. Doubtless this slow evolution of sulphurous acid takes place and preserves pyro.

Antagonism of Poisons.

The property alleged to be possessed by certain poisons of counteracting the action of others has been submitted to experimental test by M. Roger and the results reported by him to the Paris Society of Biology (*Med. Pr. and Circ.*, May 23, p. 542) are suggestive of the necessity for caution in accepting some statements that have been made upon this subject. He found that animals succumbed to the effects of a mixture of morphine and atropine long before the ascertained fatal dose of either drug separately had been reached, and the same observation was made with mixtures of atropine and quinine or quinine and morphine.

Poteline.

This is the name of a mixture of gelatine, glycerine, and tannin, to which sulphate of barium, or of zinc, may be added, and which may be colored by vegetable colors. It may be kneaded while warm. When cold it may be used for numerous purposes. It can be turned, filed, bored, polished, and can be used for hermetically sealing bottles, etc. The proportion of ingredients varies according to the uses. For sealing bottles, of course, it must be used liquid. Potel, the inventor, uses it with success for preserving meat, by applying it liquid, at a temperature of 50–60° C.—*Jour. de Ph. d'Als.-Lorr.*

PEROXIDE of hydrogen, according to Dr. Love, of St. Louis, is a most valuable agent in the treatment of diphtheria, ozæna, and in all cases of cancerous ulceration and of suppuration or necrosis. He employs it in a solution containing 0·5 to 3 per cent, using most frequently, however, a strength of 1 per cent, diluting the commercial "ten volume" peroxide with two or three times its volume of water. Of its value in clearing away and effectually deodorizing the decomposing exudate in cases of diphtheria he speaks in the most emphatic terms, and he regards the remedy also as one of great usefulness in scarlet fever, whooping cough, and other specific diseases.

Correspondence.

Lightning in City and Country.

To the Editor of the Scientific American:

Can you or any of your readers inform me if thunder storms are less severe in our large cities than in the open country? By that I mean fewer earth strokes, and of less volume.

I was led to this observation from reading in the SUPPLEMENT of February 4, 1888, of the protection afforded the summit of Ventoux, which has not been struck since the installation of the Melsens apparatus.

What that accomplishes on a small scale, it seems to me the miles of gas and water mains underground, railroad tracks on the surface, and telegraph and telephone wires overhead, to say nothing of the continuous tin roofs and lightning rods, should accomplish on a large one, in a city, but I have never seen a comparison.

There is a story going the rounds of the lay press that a building with a slate roof has never been struck by lightning. If it has happened, some one of your readers will surely know. T. H. S.

Germantown, Pa.

[While it is hard to obtain such comparative statistics, it is not impossible that some of our readers may possess them. The extensive grounding and many gas lamps and fixtures in a city should be an element of safety. —ED.]

Discovery of Comet Brooks of 1888.

To the Editor of the Scientific American:

I have the honor to announce my discovery of a new comet early last evening—August 7—in the northwestern heavens.

Its approximate position at discovery was right ascension 10 hours 5 minutes, declination north 44 degrees 30 minutes, which brings it quite near to the star Lambda Ursæ Majoris. The comet is moving in an easterly direction, at the rate of one degree daily. It has quite a large head and a broad, short tail, which, rather singularly, appears to be pointing toward the sun.

I thought at one time I should have a repetition of my experience with the comet of December 26, 1885 (which many of your readers will recall), in which, to complete my observations, I had to remove the telescope from its stand, carry it around the house, and rest it over the front fence. This last comet was quite near the horizon when discovered, and soon settled down behind the top of a pear tree, but, fortunately, the telescope revealed it among the interstices of the leaves and branches. In this way I was able to finish my observations, telegraphically announce my discovery, and it was cabled to Europe the same night. Otherwise that pear tree would certainly have had to come down—and it was loaded with fine fruit, too.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., August 8, 1888.

Carbolic Acid in Small Pox.

The experience of Dr. A. Montefuso in a recent epidemic of small pox in Naples indicates that carbolic acid is capable of yielding excellent results in the treatment of this disease. Its use as an ointment did not prove especially beneficial, but, according to the *Bulletin gen. de Therapeutique*, April 15, 1888, doses of from fifteen to thirty grains (daily ?) in about eight fluid ounces of water, for adults, led to a decided and usually permanent fall in temperature, with diminution in the frequency of the pulse and improvement in its force.

Montefuso came to the conclusion, from his experience, that carbolic acid is the only remedy which has a real influence upon the eruption in variola. He found it to limit the extent and the duration of the eruption, although he does not claim for it an abortive action. When used at the beginning of an attack, the pocks are often seen to become wrinkled and to dry up in a few days, without involvement of the subcutaneous connective tissue. When suppuration has already begun, the effect on the eruption is not so obvious, but the effect on the constitutional condition is manifest.

Montefuso did not observe any disturbance of the gastro-intestinal canal, or—except in one case—of the genito-urinary apparatus, from the doses he used and recommends. The only contra-indication to the administration of carbolic acid in small pox which he mentions is marked nervous manifestations.

If the observations just cited have been carefully made, they certainly justify testing the value of this remedy further. It is not the first time it has been proposed, but Montefuso's experience is one of the most encouraging with which we are acquainted. It will not be forgotten that the treatment of small pox nowadays is largely symptomatic, and that the fatality of the disease under any treatment is much less than it was formerly, but any remedy which has a decided influence upon the fever and the development of the eruption would be a valuable addition to the physician's armamentarium.—*Med. and Surg. Reporter.*

An Electric Indicator for Lightning Rods.

A new instrument for recording when a lightning conductor has acted is now being brought out by Messrs. Hoyer & Glahn, of Schonebeck. Briefly described, this instrument consists of a galvanometer with a long magnetized needle pivoted on a horizontal axis, and kept horizontal by a small weight. Below the needle is a soft iron core surrounded by a solenoid, which is coupled as a shunt between two points of the lightning conductor; and if this core becomes excited, one or the other end of the magnet is attracted, and remains attached by virtue of its own permanent magnetism. The inventors thus hope that the instruments will indicate not only through which conductor a lightning discharge has passed, but also the direction of the discharge, whether up or down. Instruments would be fixed on the various lightning conductors, and by mere inspection of them after each thunder storm it would be easy to see which of the conductors are most likely to be chosen by the lightning, and should therefore receive the most attention to keep in good order. Four of these instruments have now been fixed in Munich, in order to test whether the theory advanced by the inventors is borne out by practical experience.

AN IMPROVED FELLY-CLIP.

A simple and inexpensive clip for holding the tires to the fellies of vehicle wheels is illustrated herewith, and has been patented by Messrs. James Higgins and John Sullivan, of Grand Rapids, Mich. The clip is preferably stamped or formed of steel about one-eighth of an inch thick, made narrower at the central part, where it clasps the inner rounded edge of the felly, and gradually widened toward both ends, which are let into notches or recesses formed in opposite edges of the wheel tire, so as to be about flush with the outer face of the tire. The clip plate may either be fitted to the outer faces of the felly, and be bent inward rather sharply at both ends to enter the opposite side edges of the tire, as shown in Fig. 1, or it may be let flush into the felly, as shown in Fig. 2, the extremities of the clip entering the edge notches of the tire, the dovetailed or overlapping fit of the flaring ends of the clip plates on the end parts of the recesses of the wheel tire locking the tire closely to the outer edges of the felly sections, and increasing the strength and durability of the wheel.

HIGGINS AND SULLIVAN'S FELLY CLIP.

Transatlantic Electrical Litigation.

Two important cases have recently been decided in the English law courts, which may perhaps come to have an important influence upon the future of electrical lighting in that country, and which may possibly be not without some ultimate effect upon similar interests upon this side of the Atlantic. The first of these, in respect to priority of the date of judgment, related to the patent of Gaulard & Gibbs for the distribution of electricity by alternating generators and converters. The circumstances attending the institution of this action, which was on a petition for the repeal of the patent, appear to have been somewhat peculiar. It seems that a corporation known as Sir Coutts Lindsay & Co., working an installation having its central station at the Grosvenor Gallery, in London, originally equipped their system with the Gaulard & Gibbs appliances, having the converters arranged in series on the line. This was done under a contract, whereby the patentees were to be paid a stipulated royalty for every electrical horse power installed. After the plant had been some time in operation, it was placed by the company in charge of an electrician named Ferranti, who subsequently reorganized the plant, placing the converters in parallel and substituting, in part at least, new converters of his own design. A dispute, which in time arose concerning the matter of royalties, led to a cancellation of the contract and a refusal on the part of the licensees to pay further royalties. As a result of this, an action for infringement was commenced by the patentees, while at about the same time Ferranti obtained leave to bring a cross action for the repeal of the patent. This proceeding appears to have given rise to considerable comment, inasmuch as the real plaintiffs in the case were Sir Coutts Lindsay & Co.; but since the payment of licenses under the patent estopped them from denying its validity, the action was ostensibly brought by an employe. The patent act expressly enumerates, among those who are disqualified to bring such an action, the patentee of a subsequent and subordinate patent. This disqualification was, however, got over by obtaining a special leave from the attorney-general to bring the action; a circumstance which has caused much comment, and indeed reminds us, in more ways than one, of the initiatory proceedings which occurred in connection with the late Pan-Electric scandal in our own country. However, the case was tried in court and judgment given annulling the patent. An analysis of the reasons upon which the decision of the court is founded shows that the invention was admitted to be a most useful and meritorious one, and that its novelty was not necessarily impeached by any or all the numerous printed publications and paper patents put in by the defense for the purpose of showing it to have been old. The real difficulty was found in the vagueness and insufficiency of the patentees' specification, which failed to distinguish with sufficient clearness between what the patentees had done and that which was public property. We understand that the case is to be appealed, and it would seem as if there were at least an even chance of a decision favorable to the patentees. Whatever may be the ultimate fate of the British patent, it can have no legal bearing upon the status of the American patent for the Gaulard-Gibbs invention.

The opinion of Justice Kay in the Edison lamp case cannot but be regarded as an exceedingly able one, both by reason of the extent and accuracy of the knowledge of the state of the art displayed in it and of the unerring instinct by which the real issues of the case have been grasped and dealt with. The Edison-Swan Company went into court with a very strong presumption in their favor, arising, of course, from the circumstance that both the patents sued on, Edison's for the incandescent lamp and Sawyer & Man's method of treating filaments by heat in the presence of a hydrocarbon (known in England as the Chesebrough patent), had been twice sustained in an action brought against Woodhouse & Rawson. But the suit just terminated appears to have been defended with far more boldness, vigor, and ability than the others, the efforts of the defendants being mainly directed to establish the inaccuracy and insufficiency of the specification and to the inadmissibility of the broad claim in view of the prior knowledge of the art, as evidenced by the work of Swan, Lane-Fox, and other early laborers in the field. Beginning with a masterly analysis of the state of the art and of the voluminous testimony presented on both sides—and it must be confessed, in the main, exceedingly well presented—the justice reaches the conclusion that the Edison patent is invalid, first, because he aims at an exclusive monopoly of all incandescent lamps with carbon filaments, a claim which the justice says "is far too wide, considering how little Edison had actually invented;" second, because the lamp described in the specification never became or could become a commercially successful one; and third, because the carbon described could not be made without much previous experimentation. There are other objections stated, but we have enumerated the leading ones. The justice also remarked that if the same materials had been before the judges in the earlier case, he believed they would have reached his conclusion.

A careful examination of these cases has but served to confirm our first impression, that the adverse result in both was due to precisely the same cause, viz., the utter failure of the solicitors who prepared the specifications to comprehend wherein the real invention consisted, and so to differentiate it properly from the prior work of others. Each ignorantly sought to claim the whole art, instead of the particular step in advance which had really been made, and in thus grasping at a shadow the substance has been lost.

In the same judgment, the Sawyer-Man or Chesebrough patent, which is controlled in Great Britain by the Edison-Swan Company, and in the United States by the Consolidated Company, was fortunate enough to have its novelty and validity emphatically reaffirmed. We imagine it will be found somewhat difficult to compete successfully in the production of incandescent lamps without the employment of the hydrocarbon treatment, and hence the position of the Edison-Swan Company would seem to be a sufficiently secure one, notwithstanding the adverse result with the Edison patent. The British law does not permit the sale within the realm of goods made by a patented process, even though the process be worked outside the jurisdiction, and hence the holders of the Chesebrough patent are secured against foreign as well as home competition. It has been asserted, apparently by authority, that whatever result attended litigation in England respecting a patent, "*ergo*, a like result must follow in this country." It is hardly necessary to point out to the intelligent reader that this is a little doubtful, to say the least.—*The Electrical Engineer.*

LATENT HEAT OF EVAPORATION OF WATER.—Regnault's experiments were made at temperatures above 0°, and he obtained a formula which led to the value 607 units of heat, the latent heat of evaporation at 0°. Dr. Dieterici by the use of an ice calorimeter has made a direct determination of this constant, and has obtained the value 596·4 thermal units at 0°.—*Nature.*

Project for Supplying Paris from the Waters of Lake Neuchatel.

M. Ritter brought before the company of Ingenieurs Civils, at a meeting which took place on June 1, his proposed scheme for supplying Paris with water. An account of this is given by the *Annales Industrielles* as follows:

M. Ritter makes a rapid survey of the divers points concerning the execution of the works relating to his project. First, he proposes that two submerged tubes should be employed, in order that all repairs may be effected without hindering the supply of water. These tubes are to be immersed by means of four large boats, each tube being fixed at the extremity to the masonry of the aqueduct by a strong shaft, round which it can turn. This system gives every security and facility for placing them. The mechanical perforation of the large tunnel through the Jura mountains, by means of perforators mounted on carriages and driven by compressed air, will be greatly facilitated by the favorable nature of the rocks which have to be pierced. The limestone is a semi-hard rock very easy to perforate; the length of the tunnel through this mass would be only about 500 meters. The rock of the Upper Jura is somewhat harder, but also very favorable for working; the drills can easily perforate spaces of 1·50 m. every two hours, or 0·75 m. per hour, which, counting the time for clearing away the materials, bringing back the carriages, etc., which takes as long as the boring itself, represents a progress of seven meters every twenty-four hours, the work being continued night and day by relays of men every eight hours. The length of perforation through the Upper Jura will be 7½ kilometers. Then comes the Oxfordian or Middle Jura, mostly of a marly nature, which would require the lining of the aqueduct tunnel, as well as the various marls of the lower beds crossed by the tunnel. The boring of the Oxford strata would be somewhat easier than that of the limestone rocks of the Upper Jura. In this region, therefore, it may be reckoned that the progress made would be from 7 to 8 meters. Next come the oolite strata, a part of which, known under the name of pearly flagstone, would present greater difficulty, and through which the rate of rapidity of perforation by the drills would be diminished by 20 per cent, and would even descend for certain crystallized layers to one meter for every two hours' work, or 0·50 m. per hour.

However, the advancement made through these beds of the oolite group would be on an average at least 6 meters per day on account of the softer soil of which they are in a great measure composed. The length of perforation through this mass would be 10 to 11 kilos., and it would not be necessary here to face the tunnel except at the crossing of the Bathonian beds. Following these is the Liasic rock, the middle part of which is of schistose limestone, not very hard, and the lower part of limestone known as gryphee limestone. About a third of this portion would require the walls of the tunnel to be faced with brickwork; its length would be about 6 kilos., and about 8 meters per day would probably be the rate of excavation. Then comes the trias formed of sandstone, chalk, etc.; through this, if the calculations are realized, the perforation would be equally easy; facing would, however, be necessary for more than half of the length. These rocks, on the lower strata of which it is more difficult to pronounce, present no difficulty as to hardness, as the cuttings made through them in Switzerland have shown. There would then be no primitive strata with hard and crystalline rocks to traverse. The probability is, therefore, that the tunnel could be bored at an average speed of 7 meters per day.

The perforation of the longest portion of 18 kilos. would take about 1,300 days, or less than four years. But to arrive at this result it would be necessary to work with two headings, one at the base and the other at the head, and to proceed immediately to scatter the *debris* over as large an extent as is compatible with the quantity of material. There being a considerable quantity of labor available for the execution of the work, it might be accelerated, especially the clearing. M. Ritter quotes the figures he has taken as a basis for his calculations, and estimates the expense at 1,500 f. per meter for piercing the large tunnel, and 800 f. only for the smaller ones, their section being taken as 26 to 28 current meters. The works would be lighted by the electric light, produced by dynamos worked by the engines for general use. The expense of a complete installment with two carriages of eight perforators, each with their relays, the compressors of 6 kilogs. pressure furnishing the air necessary for the engines, is estimated at 300,000 f., not comprising the engines employed for the water supply. The engines for the works are included in the estimate. M. Ritter points out that these statements are founded on the estimates of first-rate constructors, who have executed the greater part of the principal tunnels recently made, particularly those of the Alps.

Referring to the siphons, their diameters of 2·50 and 2·00, and the calculations as to discharge, have been drawn from the old formulas of Darcy, but M. Ritter reckons upon profiting by the excess of speed which results from the remarkable work of M. Vallot, facilitating the more exact calculation of the discharges, and giving for the cases in question an increased speed of nearly 18 per cent for one of the diameters and 10 per cent for the second. The siphons of plate iron are estimated at 500 f. the ton; in certain similar works the price has not been more than 450 f. Every 200 meters at least an expansion joint enables the pipes to be lengthened or shortened. The aqueduct bridges will be constructed of cement concrete, which should cost 35 f. the cube meter. A great number of works executed by M. Ritter have proved to him the possibility of executing the numerous aqueduct bridges at the prices he indicates. However, he is at present calculating the net price of the works for crossing the highest ravines with piles and aqueducts of iron, the latter formed of two cases filled with concrete, covered over with a roof to prevent the water from being heated by the sun. Concerning the repairing of the masonry, M. Ritter explains that during its execution the water could easily be made to pass through a provisional canal of plate iron suspended to the girders which support the aqueduct. The question of how to cut the trenches for the aqueduct as rapidly as possible has been a subject of much consideration, and M. Ritter thinks that this kind of work can be done economically without removing the upper earth. M. Ritter explains his system of staging, making rigid arches supporting a kind of roof, which enables the rubbish to be carried off, by sustaining the earth of the vault and resisting its lateral thrust. By means of levers, the navvy advances each outer lagging of the length excavated to the frame, placing by degrees and uniting the pieces of a fresh frame, and so on. The masons follow the navvies. This system would render the slight variations in the depth of the soil of little consequence, and would considerably economize the length of the aqueduct.

The expense of the earthwork could be almost fixed, whatever the depth from the surface to the center of the work might be. M. Ritter concluded by reading a letter from M. Comtette, Counselor of State, and Director of the Department of the Canton of Neuchatel, assuring him that he may rely not only on the sympathy but the support of the authorities in carrying out his project. Not only, adds M. Ritter, would this scheme be favorable to France, an important part of the population of which would be abundantly supplied with excellent water, but it would be to the advantage of the Canton of Neuchatel. In the first place, by the indirect realization of a number of projects in connection with the making of the great tunnel; and secondly, because it would participate in some degree in the profits of the enterprise, which promises to be remunerative. It would be a real association of interest between the two parties; and on this basis the new aqueduct would assuredly be the most solid bond of union between the two nations.

Action of Bleaching Agents upon Writing Ink.

BY ROBERT IRVINE, F.R.S.E., F.C.S.

It is well known that ordinary writing is easily removed when it is acted upon by bleaching agents. Advantage is taken of this fact by unscrupulous persons desirous of altering documents, checks, and banknotes for improper purposes. Hence the number of fugitive inks and supposed untamperable papers in use to meet this difficulty.

A curious and interesting case of supposed fraud came under my notice in the form of a document which was written upon the flyleaf or second page of a sheet of legal paper, the margin of the first page containing the stamp, date, and watermark of a will purporting to have been written about twenty years ago. The document or will was thus written upon paper bearing both on stamp and in watermark a date which gave it the semblance of age. The appearance of the document gave rise to suspicion, and I was asked if it was possible to tell the age of the writing, and if the writing had been executed at one and the same time, and if so at what time.

This was, of course, impossible, as I was not allowed to treat the document itself. I had, therefore, to make experiments upon writings the dates of which I knew.

I selected writing one day, six months, twelve months, two years, six years, fourteen years, and twenty-two years old, and exposed these writings to the action of a very dilute solution of ordinary bleaching powder in water. The specific gravity was about 1001. In six minutes the newly written matter had disappeared; in from nine to twelve minutes the writing of six months ago had disappeared: in twenty minutes the writing of two years had partly disappeared; in a like time the writing of six years ago was not greatly affected; fourteen years ago very slightly; and twenty-two years hardly affected at all (indeed, old writing seems hardly affected by such a weak solution, even after hours' exposure).

Peroxide of hydrogen acts more slowly, but gives more definite results. Other reagents give effects which help (although sometimes in a contrary manner to that I have indicated) to establish the fact that ordinary writing ink, which is a compound of gallic and tannic acids with proto-salts of iron, becomes more stable (presumably by oxidation), and consequently is less or more affected by chemicals which act upon the organic coloring matter of the ink. There are great varieties of writing inks, chromium and vanadium salts being sometimes substituted for the iron salts. There are also black and colored inks prepared from coal tar dyes; but thinking it highly improbable that any documents intended for preservation would be executed in such evanescent inks, I did not investigate their behavior under such treatment. When ink is thus bleached or apparently removed, most of the iron contained in the compound remains mordanted with the fibers of the paper; consequently, writing so tampered with or dealt with can be restored by the application of gallic or tannic acid. The writing is thus reproduced almost in its original depth of color. It is delicate work (especially in the civil legal aspect of the case to which I have referred) to determine in a reliable manner the age of any particular writing, and it is necessary that the following precautions be carefully observed:

1. The inks must be those known as ordinary writing inks, prepared from iron and chromium salts and galls.

2. Writing dried by means of blotting paper is naturally more easily removed than writing which is allowed to dry on the surface of the paper; and light writing is somewhat more easily removed than coarse and heavy writing.

3. The bleaching solution must be exceedingly dilute, otherwise the action is so rapid and powerful that both old and new writings are removed almost simultaneously.

4. The action must be carefully watched so as not to be too long continued. Lastly, very old writing which has become brown by age, although it resists the action of weak solutions of bleaching powder and peroxide of hydrogen, will show signs of giving way almost instantly when acted upon by dilute nitric, hydrochloric, and oxalic acids.

Although I have only made use of a well known process and materials to obtain the results I have indicated, still I think such a simple means of detection may act as a check to frauds which are becoming only too common. There was a most interesting paper read before the Literary and Philosophical Society of Manchester, in the session of 1879 and 1880, by Mr. W. Thomson, F.R.S.E., which I commend to the study of any one wishful to carry this investigation further than I have been able to do. In it the author gives many curious and interesting facts in connection with the behavior of writing inks under the influences of various chemical compounds.—*Journal Society Chemical Industry.*

Noah's Ark Wood.

Within a radius of sixty miles of Nashville, Tenn., there is said to be found a tree that is said to be the shittim wood of ark fame. Celebrated botanists from all over the country have examined the trees and agree that they grow nowhere else on the globe. They have decided that it is the shittim wood of which Noah's ark was constructed, mention of which is made several times in the Bible. The tree is medium sized, with very dark, smooth bark, and the wood is of a bright gold color. In early spring the trees are laden with long, white blossoms, closely resembling great ostrich plumes. There seems to be no doubt about the identity of the trees, and it is remarkable that they are found only in this small area and so few at that.

Cider.

When cider is cooled to — 18 deg. to — 20 deg., a portion of the liquid soon solidifies, and the temperature rises to — 3 deg. to — 4 deg. The portion still liquid has a higher specific gravity than the original cider. The solidified portion melts to an almost colorless liquid, having a specific gravity of 1·0, and containing only 0·3 per cent of alcohol. Cider containing 4 to 5 per cent of alcohol yields on freezing a concentrated cider containing 7 to 8 per cent of alcohol and 60 to 80 gr. dry extract per liter. This composition corresponds to that of the richest Normandy cider. Both the taste and aroma of the cider are obtained in a concentrated form by freezing it. The fermentation is slowed, but not stopped, even after 212 hours.

Brazilian Anacondas.

Two large anacondas were discovered in the hold of the barkentine Emma R. Smith, which is now discharging a cargo of phosphate rock at South Camden, N. J. Each of the reptiles measures over thirteen feet long. The captain of the vessel is unable to account for the snakes being aboard of the ship, and thinks that they might have reached the rigging from dense overhanging tropical foliage while the vessel was lying in the harbor of Para, Brazil, which is conceded to be the home of the anaconda and the boa constrictor. The reptiles have thus far shown no inclination to interfere with the crew or the 'longshoremen working on the vessel. The captain will probably dispose of the snakes to some museum snake charmer.

ENGINEERING INVENTIONS.

A feed water regulator has been patented by Mr. Frederick E. Smith, of South Boston, Mass. This invention covers a novel construction and arrangement of parts, designed to provide a single apparatus of simple and inexpensive construction, which will act automatically to maintain the water in the boiler at a given height.

A wheel fastening device for car axles has been patented by Mr. Andrew J. Spicer, of Portland, Oregon. This invention provides a means of attaching car wheels to their axles in such manner that the two wheels carried by an axle will be able to revolve independently, and if necessary in opposite directions, thus avoiding undue wear and tear upon the tread of the wheel when the vehicle is passing about a curve.

AGRICULTURAL INVENTION.

A corn crib rat trap has been patented by Mr. William R. Parker, of Muddy Creek Forks, Pa. This invention covers a novel construction and combination of parts in a trap especially designed for use in connection with corn cribs, the trap being also adapted for use in the house or barn.

MISCELLANEOUS INVENTIONS.

A holdback has been patented by Mr. William Corcoran, of Copenhagen, N. Y. This invention provides a means of detachably securing the holdback strap in connection with the shafts, whereby, should the traces become loose on the whiffletree, the shafts will not become entangled with the harness.

A corn husker has been patented by Mr. Herbert S. Blair, of Bucyrus, Ohio. This invention relates to hand huskers or husking pins, in which the implement is held on the hand by a strap, and consists in combining with the husking pin or tool a flexible loop-like strap of novel construction.

A thill coupling has been patented by Mr. William M. Spicer, of Wellsville, N. Y. Combined with a pin having a stud projecting from one side, is a spring attached to the axle and having an eye for receiving the stud of the pin, making a coupling which will remain in place in the thill irons without rattling.

A suspender buckle has been patented by Mr. Charles F. Walters, of Prospect, N. Y. It consists of a single piece of wire bent upon itself, forming front and back members, making a buckle easily adjusted up and down on the web of the suspender, while connecting very firmly and securely the straps to the web.

A fountain pen has been patented by Fred A. Robinson and Amy I. Smith, of New York City. This invention relates to that class of fountain pens which employ a nib pen, and consists principally in such construction of the pen that it is adapted to have a longitudinal movement which is utilized for feeding the ink to the pen.

A spring hinge has been patented by Mr. Henry F. Keil, of New York City. This invention relates to a spring butt, and provides a construction whereby the tension of the spring may be regulated by the manipulation of one tip, the spring being completely concealed and the device having the outward appearance of an ordinary butt.

A composition for sidewalks has been patented by Mr. Louis N. Beauchemin, of Hancock, Mich. It is made of coal tar, black pitch, resin, slab tar, pulverized limestone, copper moulding stamp sand, and other ingredients, mixed in specified proportions to a mortar-like mass, and laid on a proper foundation with the aid of a heated roller.

A game counter has been patented by Mr. Ferdinand King, of New York City. It consists of a disk upon which hands are pivoted to move independently of each other in the segment of a circle, making a simple device, capable of being carried upon the person, upon which the tally of points made in any game by two or more persons may be kept separately.

A gate latch has been patented by Mr. George W. Charleville, of McKinney, Texas. A ring or rings are loosely suspended in a case, with a lever or levers for operating the rings, while the case has side plates formed to constitute guides for the rings and prevent them from sidewise rocking or play, making a latch especially designed for use on gates, barns, and the like.

A wire joint has been patented by Mr. William A. Reddick, of Niles, Mich. It is formed by cutting away one side of the end of the wire, bending the reduced portion around another section, with the flat face of the cut part next to the wire grasped, and connecting the parts by tinning, such joint being especially serviceable in making skeleton frames for various purposes.

A hydraulic lift has been patented by Mr. Thomas P. Ford, of London, England. This invention relates to the valve gear for controlling the admission of water to the main cylinder, and its circulation from one end of the cylinder to the other, enabling plug or slide valves to be used, while preventing leakage from grit interfering with the proper seating of the valves

A sea-quieting apparatus has been patented by Mr. Jens F. O. Larsen, of Copenhagen, Denmark. It is a compressible oil distributer made of a flexible pervious bag open at both ends, with rigid apertured covers and devices for closing the openings, an oil absorbent material filling the bag, out of which the oil is forced by the compression of the bag by the force of the waves.

An automatic temperature regulator has been patented by Mr. James W. Brook, of Lynchburg, Va. It is designed to automatically stop the flow of water, or open or close a window or ventilator, the device covering a novel construction and combination of parts in an apparatus having a longitudinally contractible and expansible rod, according to the variations of the temperature.

A screw driver has been patented by Messrs. George E. Gay and John H. Parsons, of Augusta, Me. It is an improved form of round-bladed screw drivers, in which the blade is secured in the handle by having its upper end driven into the wood, the upper end of the blade being so formed that by simply forcing it into the handle the screw driver is completed, without any other device to connect the blade and handle.

A wagon pole attachment has been patented by Mr. George F. Colby, of Shelby, Iowa. It is for preventing the neck yoke from coming off the pole, and consists of a longitudinally slotted and apertured tube provided with downwardly projecting lugs at each end, a spring being secured to the tube and provided with a pin engaging the aperture, the attachment being easily put on and taken off, and adapted to fit different sized poles.

A gear power for presses has been patented by Mr. Peter D. Roquemore, of De Berry, Texas. This invention covers improvements in mechanism for operating baling presses, the driving gear comprising shafts geared together at one end, with loose pinions at or near the other ends, and an intermediate fixed pinion upon a third power transmitting shaft, admitting of running either right or left, packing the bale up or down, and running at any rate of speed.

An electric regulator forms the subject of two patents issued to Messrs. Joseph A. Vansant and Frank S. Anderson, of Easton, Md. The construction is such that the normal circuit may be broken at will and the current caused to diverge and pass through a powdered material whose low conductivity is increased or diminished by compressing it more or less, thereby increasing or diminishing the strength of the current, the powdered substance employed being preferably mineral wool and carbon, one or more cells or receptacles containing the powder, and the invention providing means for compressing the powder as required.

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